SCIENTIFIC AMERICAN

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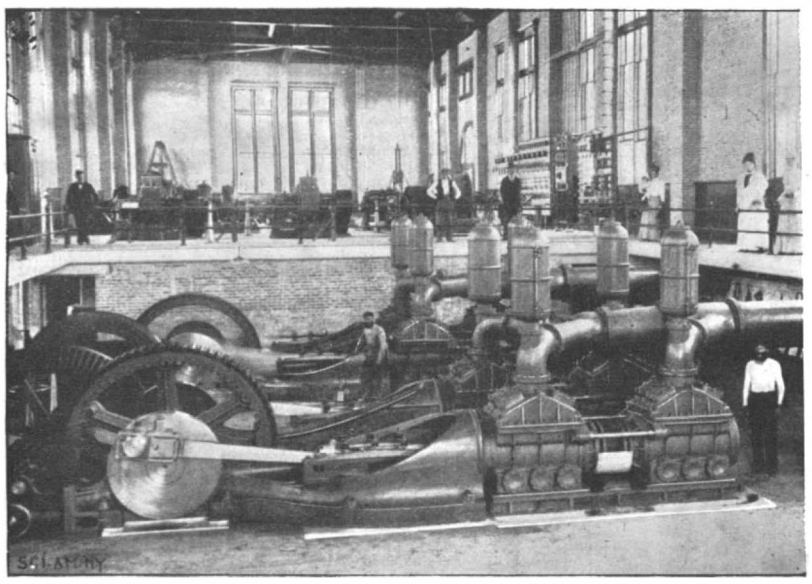
THE AUSTIN DAM.

BY H. H. CHILDERS.

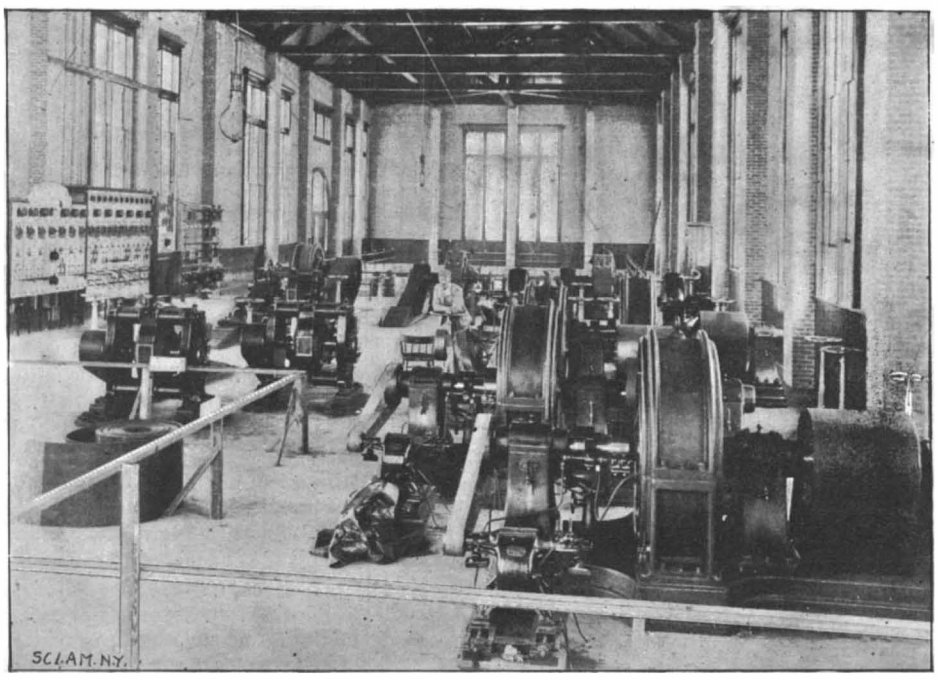
Long before the scientific mind, with the aid of capital, had determined to utilize the vast volume of water that is precipitated with such tremendous force at Niagara, the citizens of Austin, Texas, had begun the construction of a great dam across the Colorado River, two and a half miles above the city limits. Its purpose was to furnish light and water for the city and incidentally a considerable surplus power for other uses. The idea was not a new one. Examples can be found in many places.

J. T. Fanning, of Minneapolis, a well-known hydraulic engineer, who was consulted on the feasibility of the plan, said in his report: "On inspection of the new dam in progress, in company with the board, I was impressed with the magnitude of the engineering work, and especially with the exceeding great responsibility which the city has committed to the Board. I find that the dam which you have projected will raise the water of the river 60 feet above the former low water level, that it will have a maximum height to its crest of 70 feet and that its crest overfall will be about 1,125 feet long, and that the dam will flow the water twenty-five or thirty miles up the valley, creating an extensive lake. This dam is being constructed of solid masonry and is faced on each side with large blocks of excellent granite. Not for its length alone or its great area of flowage is the dam remarkable, for in France we observe three longer masonry dams—at Bouzey, Chazilla and Gros Bais, 1,545, 1,759 and 1,805 feet long respectively, and in Wales the Vyrnwy dam,

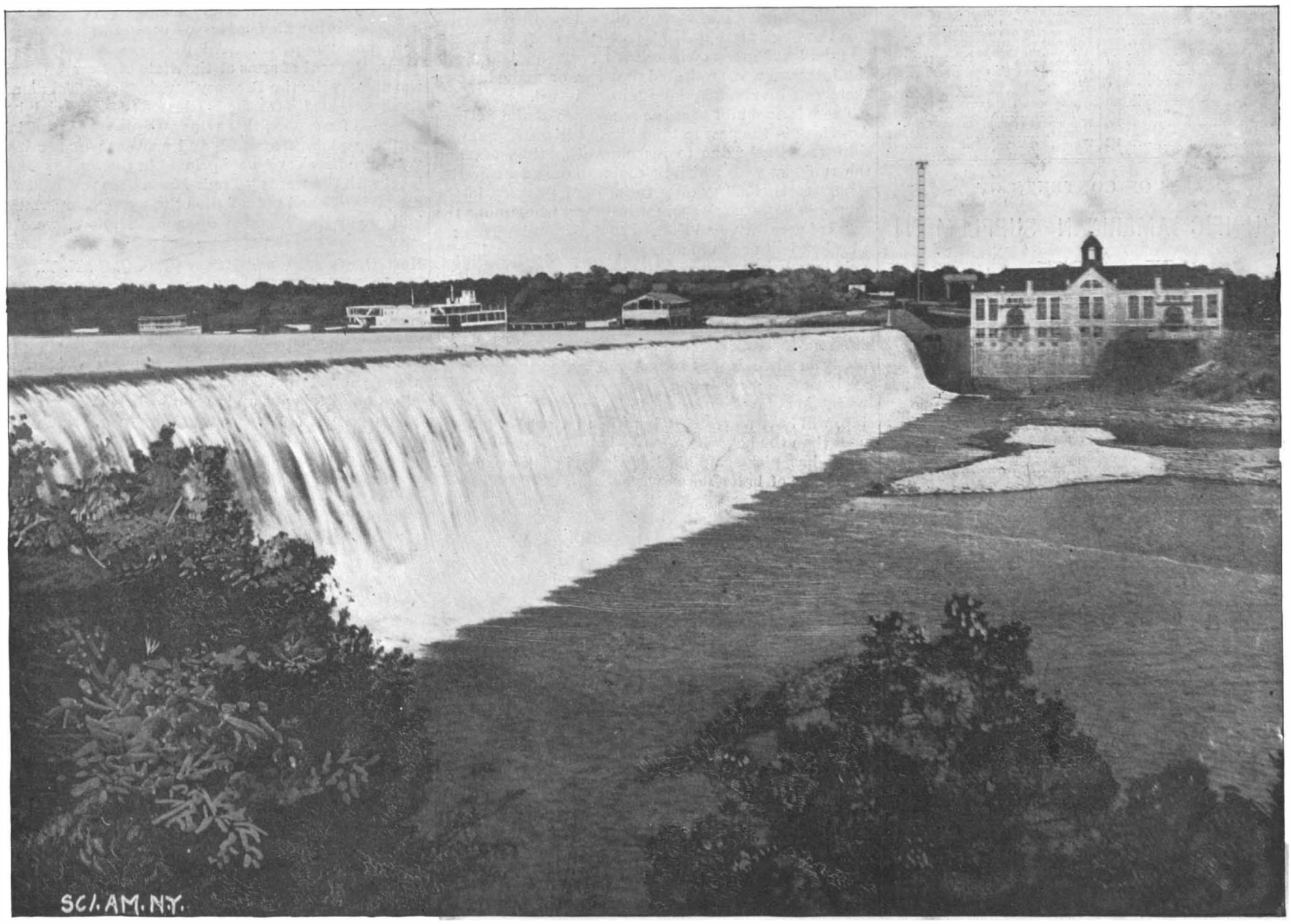
(Continued on page 137.)



AUSTIN WATER WORKS—PUMPS 4 000 000 GALLONS CAPACITY DAILY.



ELECTRIC PLANT FOR POWER AND ELECTRIC LIGHTING.



Height, 60 feet; length, 1,150 feet; width at base, 66 feet; at the top, 18 feet; maximum power, 14,637 horse power.

GREAT DAM ACROSS THE COLORADO RIVER AT AUSTIN, TEXAS.

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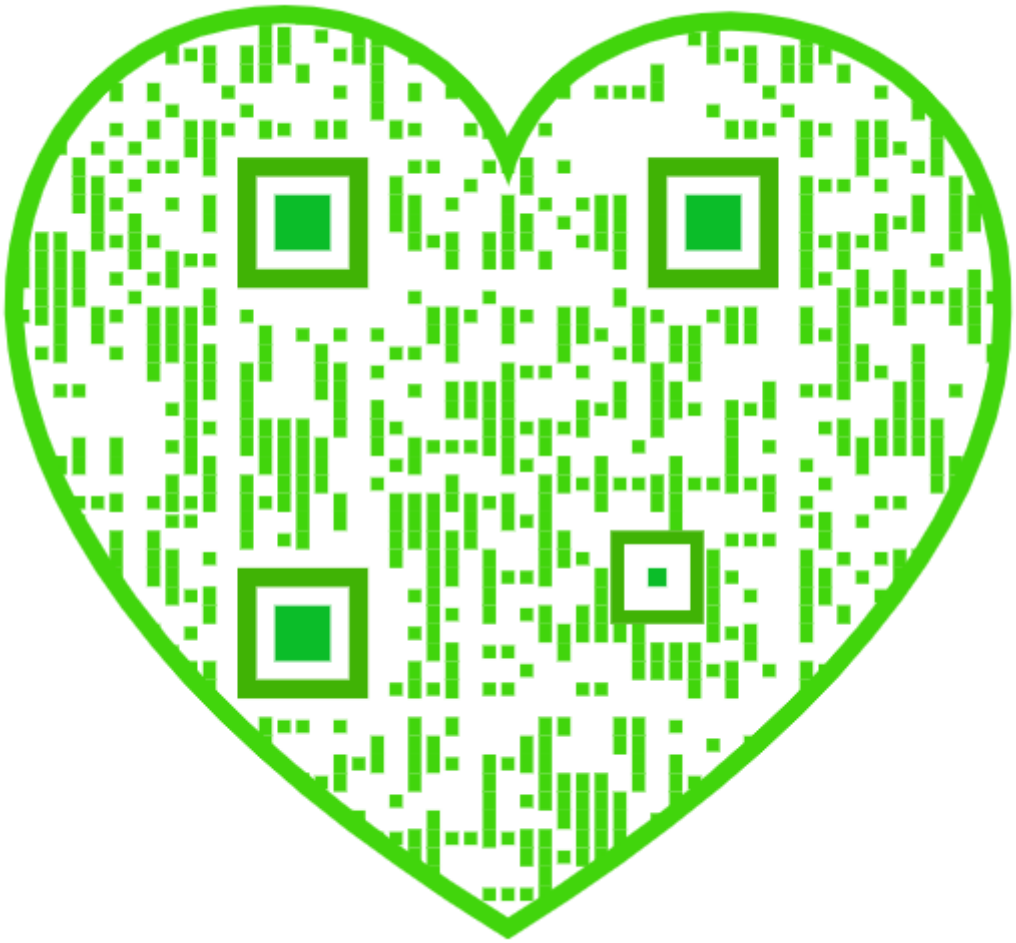

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THE IMPORTANCE OF INDUSTRIAL AND TRADE SCHOOLS.

There is matter for congratulation in the fact that the technical press is taking up the question of industrial schools and the training of the apprentice in earnest; and there seems to be a consensus of opinion that our methods need reforming, and that our present trade schools, excellent as they are, are inadequate for our needs and should be greatly multiplied. At the same time there have appeared articles, of greater or less length, deploring the increasing scarcity of the skilled mechanic; from which it appears that many of the higher industrial trades, or those trades which call for the exercise of special intelligence and skill, are unable to secure the services of competent workmen. As a consequence we are confronted with the curious spectacle of employers with vacancies which they cannot fill, and an army of unemployed clamoring for work which they cannot get. Our progress in the appliances of the mechanical acts has outstripped our present methods of turning out workmen competent to handle those appliances. This growing scarcity of the skilled mechanic is undoubtedly due to the decadence of the apprenticeship system and the inadequacy of our present industrial and trade schools, excellent as they are, to meet the growing necessities of the case.

It is a marked feature of the progress of civilization, that while it provides for existing needs, it creates others. Especially is this true of industrial development; and there is no country where these self-created needs have been so quickly seen and provided for as in America. An exception, however, is to be made in regard to the question under discussion, for while our ingenuity has called into existence a system of shops, factories, tools and general appliances which are unrivaled in the world, we have in our haste or oversight neglected to provide for that all-important factor the "human element." In our endeavor to provide tools for the workmen, we have here been in danger of forgetting to provide workmen for the tools.

There is a lesson to be learned in this matter which we shall do well to lay to heart. The rapid advances which the world has made of late years in science and art has tended to remove the dividing line between the two. The brief definition of our school-boy days, based upon the root-meaning of the two terms, which told us that science meant the "knowing" and art the "doing" of a thing, is only half true in these later days, for while the scientist may "know" without being capable of "doing," the artist (artisan) cannot always "do" without "knowing."

The march of modern industrial progress has set a discount upon the man who is merely a "handy," "all around," workman, and a premium upon the man who, to a thorough mastery of his particular craft, has added an intelligent grasp of its scientific principles, and who can interpret a complicated drawing, or make his own sketches with chalk and draughting board.

There is no doubt that the reluctance of the average American in the past to bind himself in an apprenticeship was largely due to his natural intelligence, and the rapidity with which he could, to use an expressive term, "catch on," by observation and practice, in the shops. The farmer's son, for instance, who, under the stress of necessity, had learned to repair a plow, replace a broken bolt or pin in a reaper, or even forge a link in a chain, when he entered the shop was quick to pick up such knowledge and skill as were necessary to advance him to a full journeyman's wage. But though it is true that a natural ingenuity and adaptiveness are valuable to a workman to-day, they do not count for nearly as much as they formerly did; and the industrious boy of average ability, who goes through the double instruction of a trade school and a course of apprenticeship, will have a greater value when he applies for employment than the boy who, with perhaps a greater natural talent, has picked up his knowledge in a knockabout experience of half a dozen various shops.

It is simply the systematic training of the German artisan that enables him to secure work, almost at the first application, and the past record of the American artisan is proof that were he subjected to the same training, he would invariably capture the best positions, and be intrusted with the highest skilled work, in his own country.

We have been favored by Mr. L. R. Klemm, of the United States Bureau of Education, with very full description and statistics of the Industrial and Trade Schools of Berlin. They are too lengthy for insertion in these columns, and will be found in the next issues of the SCIENTIFIC AMERICAN SUPPLEMENT.

It is well known that the Germans have worked out the Trade School problem in their usual scientific and practical manner; but our readers will many of them be surprised to learn that in the various Trade Schools of Berlin there were in 1894-95 336 teachers, 8,992 students, and that this city alone spent in this good work a sum of $209,102.

AN umbrella covered with a transparent material has been invented in England, enabling the holder to see where he is going when he holds it before his face.

RECENT PATENT AND TRADE MARK DECISIONS.

J. & P. Baltz Brewing Company vs. Kaiserbrauerei, Beck & Company (U. S. C. C. A., 3d Cir.), 74 Fed., 222.

"Kaiser" as a Trade Mark.—The word "Kaiser" used in connection with a brand of beer does not indicate the class, grade, style or quality of the beer or locality of its manufacture, and hence is not descriptive, and is a proper trade mark.

Effect of Foreign Trade Mark Law.—Under the provisions of the treaty with Germany, that citizens of Germany shall enjoy in the United States the same protection as native citizens in trade marks, etc., a citizen of Germany is not prevented from acquiring, by prior use as a trade mark in the United States, a trade mark in a particular word, although such word could not be used as a trade mark in Germany. Nor do the provisions in the treaty with Austria, that if a trade mark has become public property in the country of its own origin, it shall be equally free in the territory of the other contracting party have any effect on trade marks in the United States.

Scheuer vs. Muller (U. S. C. C. A., 2d Cir.), 74 Fed., 225.

Misleading Statements on Labels.—A statement on a label used in connection with the preparation of chiccory that the contents is "Chicorien Kaffee aus der Fabrik von E. B. Muller & Company, in Roulers (Belgian)," is misleading and unfair when the only thing done in Belgium is to harvest the chiccory root, while the roasting, grinding and further manufacturing is done in this country.

Estoppel.—The fact that the firm to which a foreign manufacturer consigns his product in this country itself puts up a similar American preparation with labels somewhat similar, although not deceiving, will not deprive the foreign maker of his right to stop the sale by third parties of an American preparation dressed up to imitate his own.

Preliminary Injunction.—In a trade mark case a preliminary injunction will be granted when the court is satisfied from the affidavits and the exhibits that the defendant's labels were devised with the intent to deceive purchasers into the belief that they were buying complainant's goods, and where such label is, in fact, well calculated to accomplish that purpose.

Beadleston & Woerz vs. Cooke Brewing Company (U. S. C. C. A., 7th Cir.), 74 Fed., 229.

Descriptive Word not a Trade Mark.—The word "Imperial" designates quality, and is, therefore, not a trade mark for beer.

Adoption of a Trade Mark.—The plaintiffs made for several years beer named "Kulmbacher," and afterward two other kinds of beer, to one of which they gave the name "Imperial." All packages bore their own name, the coat of arms of the State of New York, and the name "Empire Brewery" with the special name of the beer added. On the bottles of the Imperial beer, designed for export, this name was placed on the label with the plaintiff's name, and the coat of arms and "Empire Brewery" were printed in the corners of the label with the words "Trade Mark." It was held that the plaintiffs had not adopted the word "Imperial" to indicate origin or ownership, and, therefore, were not entitled to its use as a trade mark.

Hostetter Company vs. Bower (U. S. C. C., N. Y., Coxe, J.), 74 Fed., 235.

Hiring Witnesses to Procure Evidence.—In a trade mark suit witnesses hired by the manufacturer of a "patent" medicine to procure evidence against supposed infringers are not entitled to much weight, and where they state that they purchased of defendant imitation bitters put up in genuine bottles procured for the purpose, it appearing that they relied wholly upon the opinion formed by tasting the liquor, it is insufficient to establish infringement where such witnesses were opposed by the testimony of defendant and his employes and others that the bitters were genuine and not an imitation of complainant's.

National Harrow Company vs. Quick (U. S. C. C. A., 7th Cir.), 74 Fed., 236.

Spring Tooth Harrow Patent.—The Reed patent, No. 201,946, for improvements in spring tooth harrows, has been declared void for want of novelty.

Anticipation of a Patent.—To constitute an anticipation of an invention it is enough that a like structure had been in well established use whether all features of it originated by design or by accident.

Dodge Manufacturing Company vs. Atkins (U. S. C. C. A., 7th Cir.), 74 Fed., 241.

Limitation of Split Pulley Patent.—The Sanborn patent, No, 275,947, for a split pulley, is limited as to the first claim by the language of the patent and the prior state of the art to a solid wooden pulley divided into two sections in a serpentine or irregular course so that the parts will interlock when adjusted together on the shaft.

Thomasson vs. Bumpass (U. S. C. C. A., Va., Hughes, J.), 74 Fed., 243.

Patent for Chicken Coops.—The Thomasson patent, No. 444,561, for chicken coops for shipping purposes, shows no patentable novelty except in the form of the

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woven slatted mat forming the bottom of the coop, and, therefore, is not infringed by a coop with a different kind of bottom.

Milton vs. Kingsley (Court of Appeals, D. C.), 75 O. G., 2193.

Assignment of Future Inventions.—An inventor agreed to assign a three-fifths interest in his present and future inventions relating to a particular subject, and the assignee thereof agreed to furnish funds necessary for patenting such inventions and exploiting them, the two becoming partners in such business. Afterward they each claimed to have made a certain invention relating to the subject matter which was reduced to practice by them jointly. In an interference arising afterward between them, the only question is, which procured from the other the idea of the invention. In such a case it would be wrong to permit the assignee to procure patents in his own name only on improvements that grow out of the development of the business. It is against the theory of law of partnership that one partner should, without the consent of the other, carry on, for his own exclusive use, any business within the scope of the partnership business.

Inventions by Partners.—Where inventions are made by partners, and one has applied for a patent, it might be proper, in case of a quarrel, to have the patent issue, and then by process in equity compel an immediate assignment to the proper parties.

Croskey vs. Atterbury (Court of Appeals, D. C.), 76 O. G., 162.

Reduction of a Process to Practice.—The actual reduction to practice of a process consists in the active performance of the process. Making a device by which the process may be carried out is not a performance of the process, and is, therefore, not a reduction to practice.

Constructive Reduction to Practice.—The filing of a complete allowable application for a patent for an invention is a constructive reduction to practice, and is as effectual in contests of priority as actual reduction to practice, and filing is reduction to practice, although subsequent amendments are necessary to make it allowable.

Diligence in Reducing to Practice.—There is no general rule for what constitutes "due diligence." It is reasonable diligence, and that must be determined by all the facts in each case. However, inactivity for eighteen months in the absence of controlling adverse conditions is not reasonable diligence in the case of an invention which would not require more than a month for actual development.

International Pavement Company vs. Richardson (U. S. C. C., Acheson, J., Pa.), 76 O. G., 166.

Transfer of a Licensed Plant.—The transfer of "plant and goodwill, including the contract of license," is a contract for machines forming a part of the plant, which machines are transferred subject to the restrictions of the license, and therefore such machines cannot be used or sold except in accordance with the terms of the license.

Notice of Defect in Title.—Where machines are bought by a contract which refers to a license, the purchaser is held to have notice of the limitations set out in the license, whether he had actual knowledge thereof or not. Hence, when machines are brought under a license that prohibits the disposal of the machines except to other licensees and permits a purchaser to use the machine on certain conditions, he is bound by the terms of the license.

Boston's New Union Station.

The Boston and Albany, the Boston and Providence, the Old Colony and the New England Railroads are now about to follow the lead of the northern lines, and take advantage of the act passed by the last legislature to build a new union passenger station on the south side of Boston. The new station will front on the extension of Summer Street, Federal Street, the main line of communication between Boston and South Boston being closed. Uptown stations on the various roads will be provided for the convenience of those who visit the museum, library, or the Back Bay residential section. The freight business of the Boston and Albany will be kept upon the site of the present passenger station and of the Old Colony station. The freight business of the New England, of the Boston and Providence, and of the consolidated (Old Colony division), will all be transferred to the land of the New England road, on the east side of Fort Point Channel. The new station will bring visitors nearer to the retail and business district than before, and will tend, when taken in conjunction with the north union station, to make the business part of the city more stable.

The preliminary plans for the station are as follows: The façade on Summer Street will be four stories in height for a portion of the width, and there will be a tower 120 feet high. The general waiting room will be 300 feet long, 76 feet wide, and 30 feet high. The train shed will be 825 feet long, 610 feet wide, and will contain 33 tracks. The station and terminal will cover about 23 acres. The estimated cost of the undertaking is about $6,000,000.

The Successful Essays of the Late Prize Competition.

The publication of the winning essay in the late prize competition has brought to this office a large number of requests from our contemporaries for permission to republish the essay—requests with which we gladly comply. Those who have not as yet read the second essay, by Mr. Edmund Becker, published in the last issue of the SCIENTIFIC AMERICAN SUPPLEMENT, should hasten to do so. The writer has an acquaintance with the subject of invention, which is at once broad and detailed; and, while he has condensed the essential facts into a small compass, he has done so in such original fashion as to make the article exceedingly good reading.

The third essay, which is published in the current number of the SUPPLEMENT, was written by a gentleman whose name and versatile pen have been long familiar to the readers of the SCIENTIFIC AMERICAN—Mr. George M. Hopkins. For a period of twenty years Mr. Hopkins has been an important contributor to our columns; and his elaborate work, Experimental Science, is one of the best known works of its kind in existence to-day. The essay is just what we should expect from the author: pointed, comprehensive, well balanced, and characterized by that directness and lucidity of style with which our readers are so well familiar.

Nassau's Phosphorescent Lake.

Having in remembrance old Sampson Stamp, of Key West, the discoverer of the sea gardens at Nassau, we took a pilot and sailboat the following morning and sailed some four miles up the channel. There we embarked in a rowboat with a glass bottom, made by inserting therein plates of thick glass, through which the bottom of the sea spread out before us like dry land. A strange feeling crept over me and in imagination I fancied myself with Jules Verne on the voyage of Twenty Thousand Leagues Under the Sea. We could see all the little fishes, minnows one inch long and larger kinds one foot, two feet and three feet in length, some white and black and blue, besides many angel fish, all yellow like a canary, with bright blue fins and tail, swam by beneath us. As the ripe wheat fields in summer sway to the breeze, so there in the submarine currents waved great bunches of fan leaf coral, purple, yellow and white. The water was clear as air, and, pointing to some especially beautiful specimens of rock and fans, our little darky dived over, and, like the fish, we could see him swimming down until at last, clutching the growth with two hands and feet firmly braced against the coral, he gave a tug and away he came to the top, fan in hand. Indeed, God hath wrought marvelous things in this world of His, but nothing of greater bewitching fancy than the sea gardens of Nassau.

When night came and before the moon was up a drive of two miles back on New Providence Island brought us to a most interesting work of nature. A lake some 1,000 feet long and 300 feet wide lay quiet and black as any other sheet of water at night might do. But once in a rowboat and shoved off from shore what a mighty change was wrought! Two small out-swimmers, the hue of the surrounding darkness, accompanied our boat of fire, for such it seemed. Like two human torches our darkies swam by our side as in a cloud of phosphorescent fire. At the slightest disturbance the whole surrounding water lit up like molten silver. Each boy's toes and fingers were as though the sun shone on them, and fish darted through the quiet water like skyrockets, leaving a glittering trail behind. The light was so vivid I could see the time by my watch, and when a wave was sent upward with the oar the falling drops were like blue tinted pearls. The movements of our boat made enough light to plainly show the bottom, for the water is from the ocean and as clear as all that which nature makes to flow about those lovely Bahamas. Enticed by the water's warmth and the hot night my friend and I went in swimming, but only for a few minutes. From this swim comes a story hard to believe, but as true as Gospel. That night, as was my custom before turning in, I went to the bathroom, which I could easily darken, to change some photo plates in my holders. When about to pull the slides I noticed the phosphorescence, which I had brought from the lake, shining from my bare feet and giving so much white light I had to cover them with a towel before I dared expose the plates to what a moment before had been intense darkness.—Forest and Stream.

A Big Shipyard Fire.

The famous shipyard of Harland & Wolff, on Queen's Island, near Belfast, Ireland, was visited by fire on July 27. The fire began in the engine fitting department, and as a high wind was blowing, the flames spread rapidly. An immense quantity of valuable machinery belonging to vessels in course of construction at the yards was ruined, as were also the tools and machinery in the various shops. A conservative estimate of the loss is $1,250,000. The yards occupy an area of eighty acres.

Cycle Notes.

Cycling was strictly prohibited during the recent coronation fetes at Moscow.

In attempting to tighten up a worn nut, put a little resin on the jaws of the wrench; this will enable it to get a better hold.

Prof. Virchow was recently thrown down by a bicycle on one of the Berlin streets; fortunately he was not much injured.

It is now a misdemeanor in New York State to throw upon a public road tacks, glass or any sharp substance likely to injure the tires of bicycles.

The soldiers of the United States Army can thank General Miles for the arrangements he has made by which they can obtain wheels at low prices on easy terms of payment.

The French bicycle manufacturers propose to test each wheel and mark upon it the weight of the rider which it will bear without injury. This is an excellent suggestion, and could be adopted with profit in the United States.

The city of Copenhagen, where the world's championships are to be held in August, has probably the largest proportion of cyclists to the population of any large city in the world. In a total population of 450,000 there are 30,000 riders.

The whaleback steamer Christopher Columbus, now running from Chicago to Milwaukee, has been provided with a bicycle track (eight laps to the mile) on the lower deck. This track is so arranged that it does not interfere with the other passengers.

The lot of the small number of Roumanian cyclists is a hard one, for not only must they have their names and addresses fastened on their machines, but they must also have it on their lamps, and cyclists in the streets of Bucharest must ride in single file.

One bicycle has been supplied to every police station in the suburbs of Paris for the use of the force. If the training of policemen proves successful, more machines will be supplied. Meanwhile, every policeman who uses his own bicycle while on duty will receive fifty francs.

The sextuplette team of Syracuse has been practicing for some time with their large machine. It is said that they recently beat the Empire State Express of the New York Central Railroad. It does not appear that the train was under full headway, however. The machine ran in a specially prepared track four feet wide, and is said to have finished four lengths ahead of the engine No. 999.

To clean a muddy bicycle proceed as follows: Let the mud dry, then take a cloth with a little oil on it, pass it around each tube of the frame, and holding the ends, one in each hand, pull them alternately, dragging the cloth backward and forward. By this means, and with the aid of a spoke brush for some of the parts, the mud is quickly rubbed off and the enamel left unscratched.

A newspaper in the City of Mexico keeps the following standing matter at the head of its cycling column: "Pedestrians should not stop short or run ahead when crossing the path of a wheelman, but should pursue their course unmindful of him, as the cyclist has all the advantage in dodging front or rear. All accidents are caused by the indicision of pedestrians. This rule should become universally known."

The ball bearings ordinarily used on bicycles should be so adjusted that no side "play" is perceptible, but not tight enough to "bind." This is in reply to a number of readers who have asked whether the bearing should not be loose enough to allow the shaft to move slightly sidewise. In the language of a prominent bicycle manufacturer, "bearings should be absolutely tight and yet perfectly loose." Although seemingly paradoxical, there is a point, and not a very narrow one either, where the bearing may run perfectly free, and yet be tight enough so that no "lost motion" is apparent.

In repairing a single tube tire, it is well to exercise a little care in estimating the size of the plug patch. The tire is often condemned when the plug does not hold, while, in reality, the fault lies in the inefficient material used. A plug with a blunt edge patch should in all cases be of as ample area as the aperture in the tire will permit of inserting. A common mistake is the application of a thick plug with no patch base, which common sense should tell the user will not answer the purpose. A single tube tire can be repaired both easily and permanently, provided proper care is used in the selection of the material.

A bicycle chain should not be tight, says the L. A. W. Bulletin. No chain and wheels can be made which will run well unless there is a little "slack" to the chain. In fact, there is no danger of the chain being too loose so long as it cannot possibly get off the teeth of the sprocket wheels. If you have any doubt as to whether a chain is loose enough, roll the machine forward a few steps, and while it is still moving forward, slightly take hold of the lower part of the chain, and unless it has the feeling of being perfectly loose, the adjustment is too tight. A chain should be kept well oiled in its bearings. But very little oil, however, should be allowed to remain on the outside.

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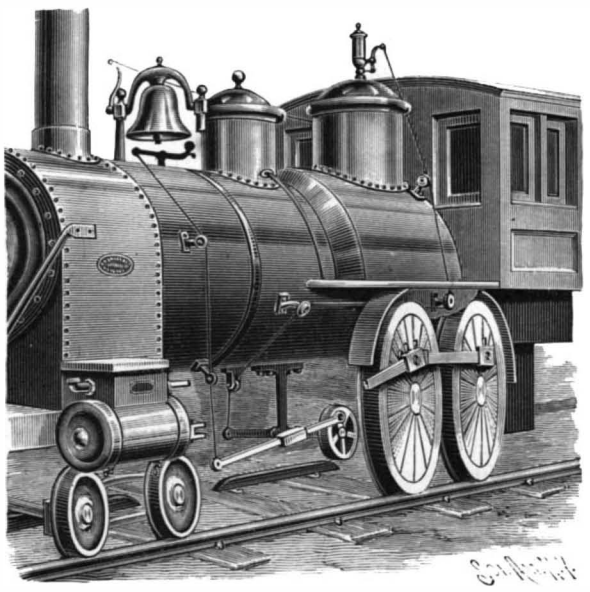
AUTOMATIC LOCOMOTIVE SIGNALING.

Appliances for automatically ringing the bell and sounding the whistle of a locomotive, as the train approaches a crossing or other point where it is desired to give warning, are shown in the accompanying illustration, and form the subject of a patent issued to Horace M. Baker, of Carthage, Mo. On the under side of the locomotive is a downwardly-extending bracket carrying a rigidly secured short transverse shaft, on the right hand end of which is fulcrumed a lever with a wheel on its rear end, while the forward end of the lever is



BAKER'S LOCOMOTIVE SIGNALING DEVICE.

connected by a cord passing over pulleys to the lever of the steam whistle. Pivotally mounted on the left hand end of the shaft is a sleeve in which slides a rod whose rear end is pivotally connected with the same wheel, while its forward end is connected by a cord passing over pulleys to a lever on the support of the locomotive bell. The lever actuates a supplemental clapper arm to sound the bell, a spring holding the clapper arm normally away from the bell. Arranged along the track is a third rail, which may be a continuous rail or a series of broken rails, these rails having beveled ends, and being so placed that, in the passage of the locomotive, the wheel supported from the bracket will ride upon the third rail, the depression of the lever causing the whistle to be sounded, and the rotation of the wheel sliding the rod in the sleeve and swinging the other lever to ring the bell. The third rails are placed along the track near crossings, and at other places where it is desired to give warning, a continuous rail causing a continuous blast of the whistle and a series of broken rails producing intermittent blasts.

A NEW ELECTRIC MINING LOCOMOTIVE.

We present an engraving of a new type of mining locomotive made by the Baldwin Locomotive Works and the Westinghouse Electric Manufacturing Company, by virtue of the arrangement which these two companies have entered into. The locomotive was built for the Crozer Coal and Coke Company, at Elkhorn, W. Va., in the Pocohontas coalfield. By reference to the illustration it will be seen that the locomotive is very heavy and powerful, as the grade is considerable and the loads are large. The specifications called for a six-wheel electric locomotive capable of drawing 40 loaded cars up a 2 per cent grade at a rate of 6 miles per hour, developing a draw bar pull of 10,000 pounds. The track gage is 44 inches and the rails weigh 40 pounds per yard. The locomotive will pass through an opening 6 feet 11 inches high above the rails, 10 feet wide at bottom and 8 feet wide at top.

The locomotive shown in the accompanying illustration weighs 44,000 pounds and has the following dimensions :

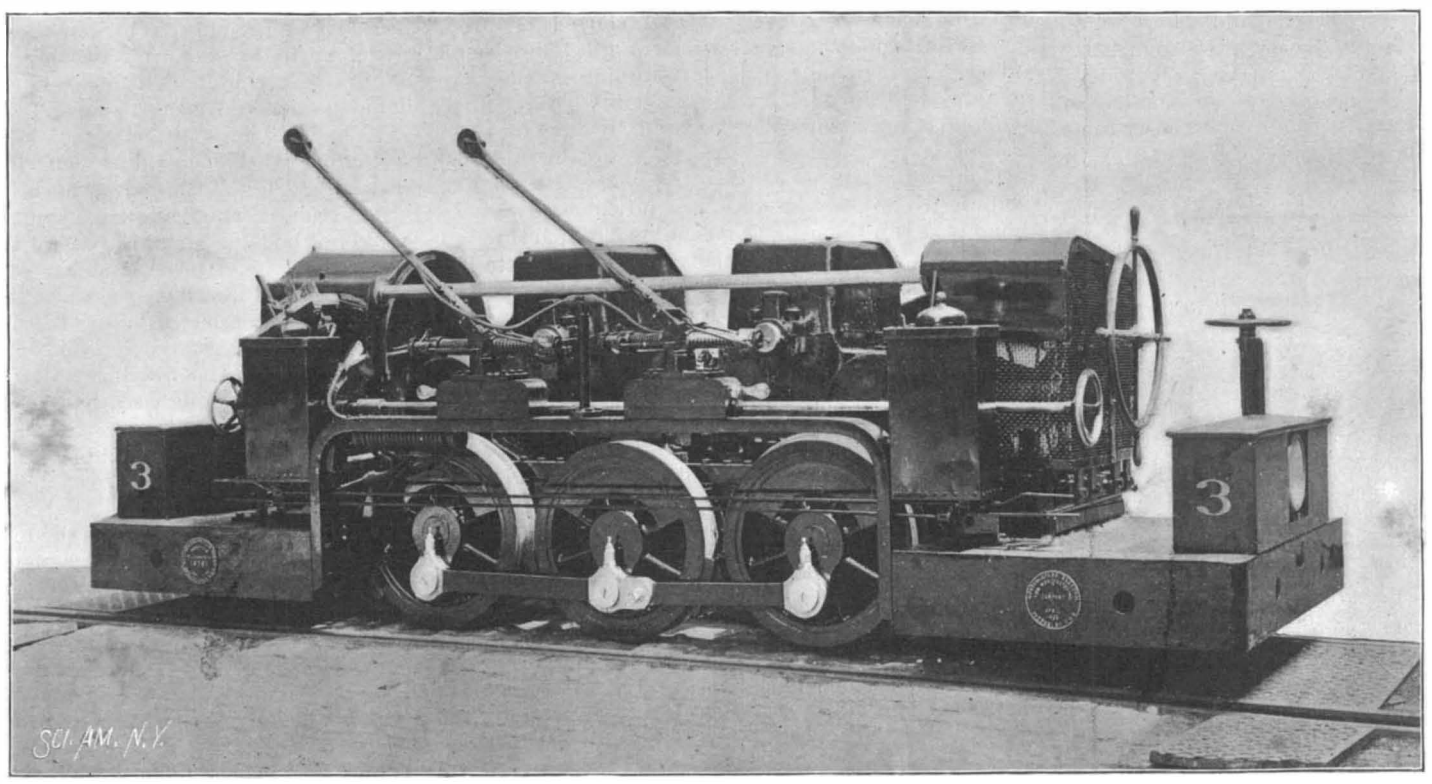
Diameter of driving wheels	33 inches.
Wheel base (total)	6 feet.
Width	6 feet 2 inches.
Length (total)	18 feet.
Height (total)	5 feet 6 inches.

The wheels are of cast iron, spoke type, keyed to axles, which are composed of best hammered iron and provided with journals 5½ inches diameter and 6½ inches long. The brakes can be operated from both ends and are of sufficient power to slip drivers ; sand boxes are also provided.

The electrical equipment consists of two 100 horse power Westinghouse motors, one controller, one rheostat, two trolleys, two electric headlights, Wurts lightning arrester, switches, etc. The two motors, which are mounted near the center of the locomotive, are of the consequent pole type, similar in construction to those used by the Pennsylvania Railroad on their Mount Holly, N. J., branch. They are series wound and may be operated either in series or parallel. The series arrangement is used for slow speeds and the parallel for higher speeds.

The motors are connected to driving axles by double reduction gears. The controller shown near the front of the locomotive in the illustration is of the commutator type and can be operated from either end by means of a suitable shaft and gear. The change of direction of travel is accomplished by changing direction of rotation of the controller handle, no reversing switch being used. The rheostat is mounted on the rear, as shown, and consists of coiled iron strips mounted in a suitable casing. One electric headlight is placed at each end and two lamps are placed on each side of the locomotive. A switch is provided for changing the connections of the motors from series to parallel and another switch cuts off all current excepting to the lighting circuit, which is provided with a separate switch. The wires connecting the motors, controller and rheostat are inclosed in an iron pipe, thus providing complete protection.

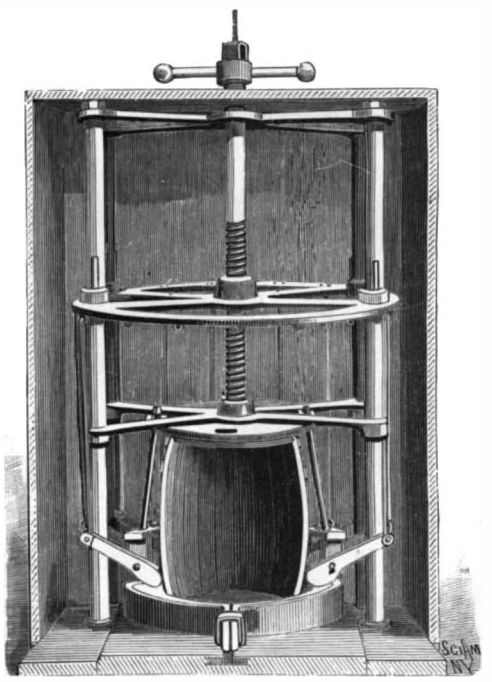
The average speed of the locomotive with the motors in parallel is 6 to 8 miles per hour. As the generating capacity is limited, only 25 cars are at present in use. Mather generators wound for 500 volts furnish the power. They are actuated by a McEwen automatic engine, and the generators also supply a smaller locomotive and electric coal cutters. One trolley arm is provided for each direction in which the locomotive is run. The connecting rods are an interesting feature and doubtless add to the tractive effect. The results obtained are highly satisfactory and this installation adds one more to the already long list of successful applications of electricity to mining work.



A NEW TYPE OF MINING LOCOMOTIVE.

AN IMPROVED BARREL-FORMING MACHINE.

A machine designed to facilitate the forming or completing of barrels, casks, etc., is shown in the accompanying illustration, and has been patented by John Hauenstein, of New Ulm, Minn. The working parts of the machine are intended to be placed in a steaming box, in one side of which is a suitable door-closed opening, outside of which extends a portion of the bed or platform. The carriage and hoop holder comprise two semicircular sections hinged together, the upper surface of the ring-shaped carriage being inclined downward and inward, and the under surface of the carriage has T-shaped legs adapted to engage a guideway or slot in the bed or platform, to properly guide and center the carriage when it is moved into the machine. Above the carriage is a presser-plate and carrier for a suspended cam ring, the presser-plate having outwardly extended arms having loose connection with the standards of this machine, permitting the plate to move vertically. Above the presser-plate and also movable vertically on the standards, is a screw-plate through which extends the operating screw, the upper ends of



HAUENSTEIN'S BARREL-FORMING MACHINE.

the standards being connected by a spider frame, through which, and through the top of the steaming box, the screw shank extends. The cam ring is provided with a series of openings, in which cam levers are pivoted, the cam ends extending within the ring to operate on the barrel staves, and the lever arms having outer link connections with the screw plate. The cams are arranged quite close together, to present a practically continuous contractible bearing ring. In forming a barrel, the carriage being outside of the steam box, the staves are assembled on it and loosely held together by the upper hoops, a bottom hoop lying in the bottom of the carriage, and the lower ends of the staves extending in a larger circle on the incline above. The carriage is now moved into the machine within the steam box, and after sufficient steaming the cams are lowered and the screw operated to rock them against the staves, whereby the lower ends of the staves are bent to come within the inner diameter of the carriage and hoop, as shown in the illustration, the operation of the screw also bringing the presser-plate against the upper end of the barrel and forcing it downward. When this is finished the cams will be in a position to leave the staves, and the parts being moved upward, the carriage with the barrel may be drawn out of the machine.

To get rid of the odor of iodoform Herr Apotheker Kontеschweller, Roumania, advises (in the Pharm. Centralh.) the use of an alcoholic hexamethylentetramin solution, with which he claims it is necessary merely to moisten the hands or the article affected. A "grundliche Enternung des lastigen Iodoformgeruches" is the result—which means that the odor disappears in the presence of that of the solution named. What an odor of its own it must have ! though the name is enough to scare almost anything away.

AN ELECTRIC COMBINATION.—A combine of the largest incandescent manufacturers in the United States has been formed. This will virtually put an end to the war of prices which has practically done away with all the profits in this line of business.

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THE AUSTIN DAM.

(Continued from first page.)

1,350 feet long, the latter being for the storage reservoir of the Liverpool water supply. Not in the height alone, for in France there are three dams, in Spain two, in Belgium one, and in California one masonry dam exceeding 150 feet in height. There are fourteen other notable masonry dams having heights exceeding 100 feet. But none of these dams are upon great rivers, and very few of them have the water passing over their crests."

There is one example of greater water power, but obtained under different conditions. The following is a list of the other great water powers of the United States:

Minneapolis	25,000	horse	power.
Holyoke	12,000	"	"
Manchester	12,000	"	"
Lowell	11,000	"	"
Cohoes	6,500	"	"
Watertown	4,675	"	"
Oswego	2,500	"	"

The maximum force of the Austin dam is 14,639 horse power, or 224 mill power, according to another unit of measurement. The measurement of the Austin dam, 1,150 feet in length, 60 feet high above low water line, 66 feet in width at base, and 18 feet in width at the top.

As early as January 4, 1839, when Austin was mentioned in an act of Congress as the probable seat of government for the Republic of Texas, attention was called to the possibilities of a large supply of water power from the Colorado River. In 1871 and 1873, the question of erecting a dam across the Colorado River at Austin was seriously discussed and the plans partially matured.

The actual construction of this dam began in 1890, after the city of Austin had voted a municipal tax that was expected to realize a sum equal to $1,400,000. On the 24th of June, 1895, the city voted for an additional issue of bonds to the amount of $200,000 to complete the work already begun, and which was then incomplete as to reservoir, settling basin and water pipe. The dam proper was completed May 2, 1893. In 1895 every part of the structure was finished except the reservoir and additional piping. The contract has already been let for the construction of the former.

The Colorado River at Austin drains, approximately, an area of 40,000 square miles, and at the highest floods furnishes a flow of 200,000 cubic feet per second and a mean flow of 1,000 feet per second. The river in this section flows between high hills without alluvial valleys and between bowlders and deposits of lime rock, supplied largely by springs in dry seasons.

The artificial lake that the erection of the dam has created extends up the Colorado River 30 miles, has a water surface of 8 square miles and a total volume of 2,800,000,000 cubic feet of water. The widest point on the lake does not exceed a quarter of a mile and the maximum depth is 60 feet. It is called Lake McDonald, in honor of John McDonald, who was Mayor of Austin during the period of the construction of the dam.

Mr. Ellison Saunders was president of the Board of Trade of Austin immediately prior to the inauguration of the movement that contemplated this great engineering feat, and it was largely through his untiring effort, assisted by a few other public spirited citizens, that the enterprise assumed a substantial shape.

The material used in the body of the dam is the best quality of red granite, obtained in Burnet County, Texas, 60 miles distant, the same out of which the Capitol is built, limestone, found in the immediate vicinity in inexhaustible quantities, and hydraulic cement. The original contract for masonry, material, etc., was $611,313.39.

The power house was erected at a cost of $45,917.98. The remaining expenditure, that in the aggregate reached the sum of $1,600,000, was or machinery, penstocks, turbine wheels, pumps, sluice pipes, water pipes, electric towers, etc.

The turbine wheels in use are of the "Victor" pattern except one, the "American," that is used to operate the 3,000,000 gallon Goulds pumps, made in Chicago. Another pump of a capacity of 4,000,000 gallons daily is also in use. This part of the machinery was furnished under contract by the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, amounting to $47,954.00.

The electrical distribution system was furnished by the Fort Wayne (Ind.) Electric Corporation at a cost of $115,678.29, which included towers, poling, wiring, etc., and did not include dynamos furnished by them at a cost of $7,700.55.

The power for street car service is developed by two 125 H. P. Multipolar Generators, Thomson-Houston type, manufactured by the General Electric Company, of Schenectady, N. Y.

The incandescent lighting is from Wood alternators; the total number of 16 C. P. lights is 15,000. The arc lights of the city are 189, and are suspended from 31 iron towers 150 feet high. Under the contract the light emanating from one of the towers with six arc lights was to be sufficiently bright to see the time of night by an ordinary watch, within a radius of 3,000 feet. The arc light machines are of the "Wood" make, three in number, with a total capacity of 240–2,000 C. P. lights. The power for industrial purposes is produced on a three-phase (Wood) 250 H. P. generator.

The four governors regulating the speed of the waterwheels, which furnish the current of electricity for the street car service, were furnished by the Replogle Governor Works of Akron, Ohio.

The cast-iron water pipes and special castings cost the city $107,582.15, and for laying the same $31,205.07.

When the subject of owning and operating its own water and light plant was first suggested to the people of Austin (which has about 25,000 inhabitants), they were confronted by strong opposition from the private corporation that was then furnishing light and water to the city. This corporation claimed to have vested rights and an unexpired contract. After a protracted litigation, annoying and expensive to both, a compromise was effected that has put an end to further contention.

The argument that decided the city of Austin to adopt the public plan of watering and lighting the city was the great reduction in cost to individual consumers and the advantage to be derived from a large surplus power for future commercial use, and for this use it can lease at least 12,000 horse power.

A disposition upon the part of municipalities to run and operate large plants has shown itself in many countries, particularly in Switzerland and in parts of Scotland, and the city of Austin claims to have already realized the wisdom of its departure from the old plan. Anterior to the construction of the Austin dam a private corporation, operated by aliens, furnished the water supply with the Holly system, and it had not only proven itself inadequate to supply the demands of the growing city, but the service was inferior, on account, in part, of the absence of a reservoir and other essentials of more modern use.

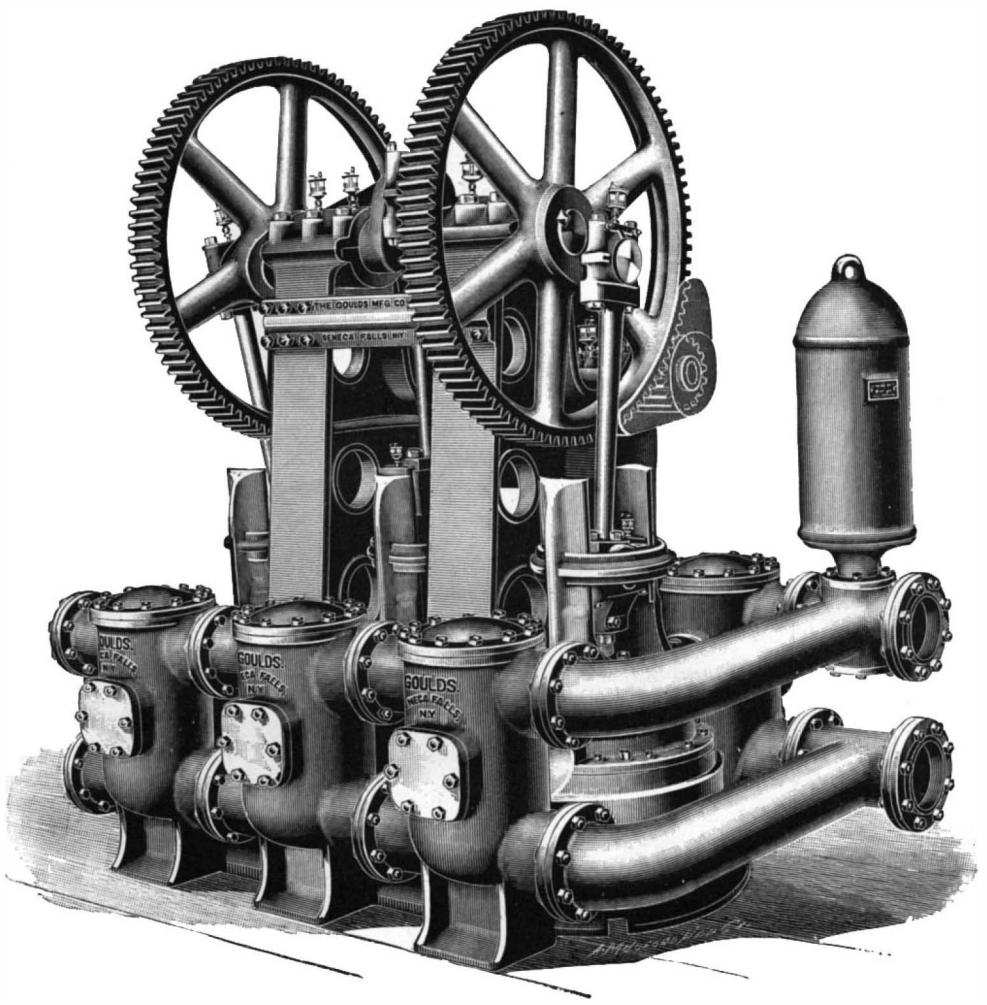
The city of Austin has not received benefits alone from the larger and cheaper supply of water, better and cheaper lights, and additional power for commercial use, by the construction of the dam, but it has at its door one of the most beautiful inland lakes in the world, the delight of the angler and those fond of aquatic diversion.

Steamers ply in these waters, and during the summer seasons give life and activity to the landscape and exhilarating amusement to the pleasure seekers by making delightful cruises up and down the lake for twenty miles.

Two of the most celebrated international regattas of the last decade have been held on these waters, and the cracks of the two hemispheres were there for the prizes that the management offered for the encouragement of the sport.

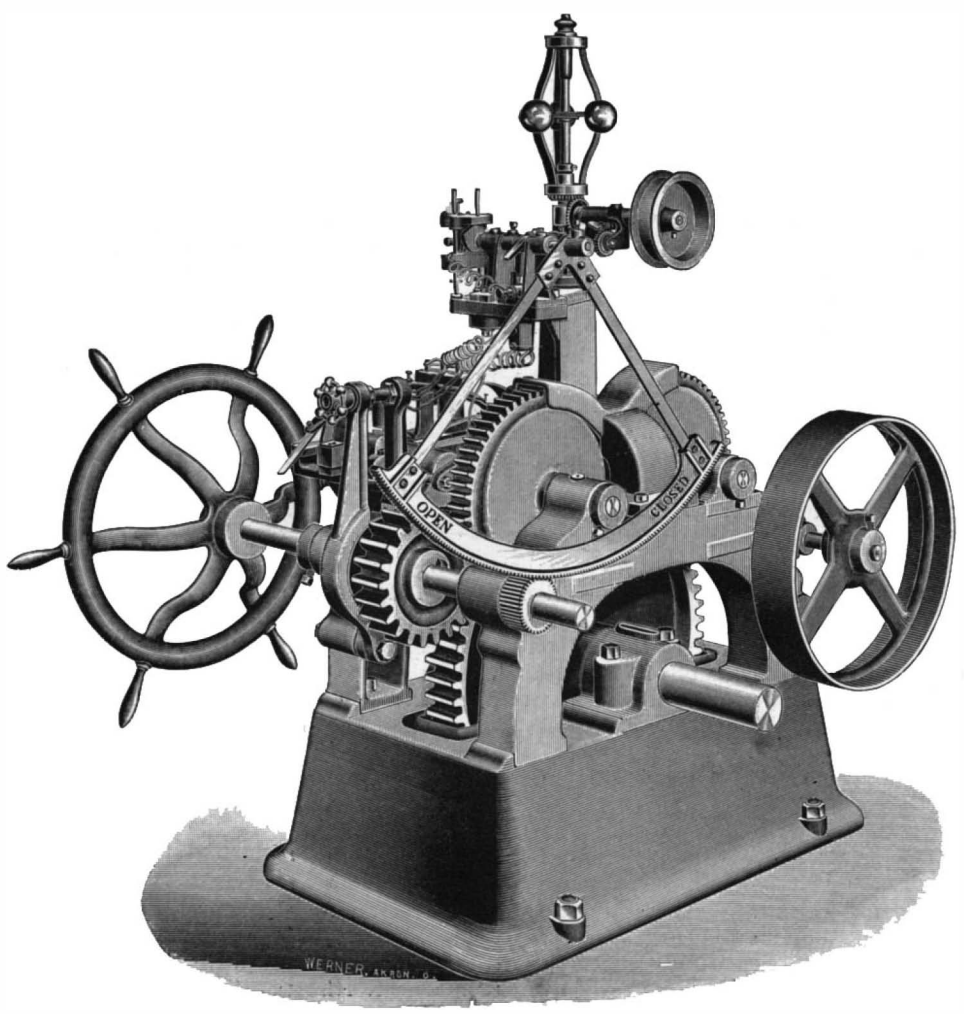
John F. Pope, a local engineer, after a careful examination, reported favorably upon the practicability of the dam, but Joseph P. Frizille, of Boston, was the first civil engineer whose able report gave the first substantial impetus to the movement. He was made chief engineer of construction, and after his retirement, some months later, a number of engineers successively occupied the same position, and a strange fatality seemed to attach to the office. Gorham P. Low, of Gloucester, Mass., one of the engineers, was stricken with paralysis, and died January 8, 1894. Joseph Kepferle, another, died suddenly December 7, 1894. G. W. Sublette, of Minneapolis, was the last in charge, and remained at his post until the services of an engineer were no longer required.

A company, with a capital stock



GOULDS TRIPLEX WATERWORKS PUMP.

Two in use. Combined capacity, 3,000,000 gallons daily.



REPLOGLE'S ROTARY WATER WHEEL GOVERNOR.

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of $100,000, has been organized, and are now taking the initiative in the erection of a cotton mill at the dam,

COMPARATIVE STATEMENT OF COST PER LIGHT IN CITIES HAVING PUBLIC AND PRIVATE PLANTS.

PUBLIC PLANTS.

Cities.	Population.	Cost per Light.
Ashtabula	8,000	$77.00
Little Rock	25,000	70.00
Elgin	22,000	62.00
West Troy	13,000	60.00
Marquette	9,000	60.00
Frederick	8,000	60.00
Aurora	20,000	58.00
Madison	9,000	58.00
Alexandria	14,000	55.00
Lewiston	22,000	55.00
Bloomington	20,000	51.00
Decatur	17,000	50.00
Hannibal	13,000	50.00
Bay City	28,000	49.00
Jamestown	18,000	44.00

PRIVATE PLANTS.

Cities.	Population.	Cost per Light.
Kalamazoo	24,000	$170.52
Houston	27,500	150.00
Springfield, Ill	25,000	137.00
Peublo	34,000	132.00
Waterbury	24,000	121.00
Springfield, Mo	22,000	114.00
Wichita	24,000	108.00
Joliet	23,000	100.00
Cleveland	340,000	88.00
Auburn	26,000	87.50

and similar enterprises are likely to follow, until all the remaining surplus water power is utilized.

The author of this article is largely indebted to Mr. John T. Smith, a civil engineer, of Austin, for facts, figures and pictures.

The Psychology of Crowd Panics.

The recent crowd panic on the Hodynsky Plain, in Russia, with its frightful loss of life, emphasizes the danger in all large gatherings of sudden explosions of fear and demonstrates the impossibility of controlling a thoroughly frightened multitude, says the Medical Record. It is the history of every crowd under like circumstances, although the damage done in the present instance outweighs that of any similar occurrence in history. The latest estimate of the number of the dead is three thousand six hundred, that of the wounded being over twelve hundred. It is also stated that over five hundred thousand peasants were gathered on the plain in question, with a very inadequate police force and with all the elements which might tend to make the mass of humanity irritable and excitable. The lesson of results is one which the world at large will not easily forget. The horror of the situation passes the power of description, even by the alert and graphic newspaper correspondents. It was a tidal wave of unreasoning brutality forced against the comparatively weak barrier of human resistance. To such as look upon a crowd as an aggregation of human force, a multiplication of personal energy, and an ever-present consciousness of individual weakness, it is surprising that such calamities are not of more frequent occurrence, and that the law of accidents does not swell its statistics to frightful proportions.

If we study a crowd as we would an individual, there are many interesting phenomena to note which may serve to explain the reasons for panics and the most rational means for their prevention. The very gathering of a large number of people implies a concentration of interest in a given and definite direction. There is an individual as well as a general aspect of the condition. The individual is so small a part of the whole that he becomes overawed by the impression of the latent and implied power of accumulated mental and bodily interests. It means stage fright to the one who faces it on the one hand, and on the other hand becoming respect by the one who merely forms a part of it. There is always a something about a crowd which manifests a strained and tense degree of mental activity, a hyperexcitability to casual impressions and a corresponding lack of control of ordinary individual emotions. Thus the flattest joke oftentimes produces an applause which is proportionate to the size of the audience rather than to its supposed intelligence. Contrariwise, the most trivial mishap awakens the most foolish terror. Excitement, irritability and then fear rapidly follow each other on the slightest provocation. What would be trivial to an individual is terrible to a crowd. It is a question of degree merely, and is proportionate to the power behind. The mental tension, stupendous and formidable at best, is apt to give way with a sudden and dreadful snap. It is the spark to the magazine. The slightest exciting cause may start the train of the most unreasonable apprehension, which become intensified in proportion to the demonstrated difficulty of escape.

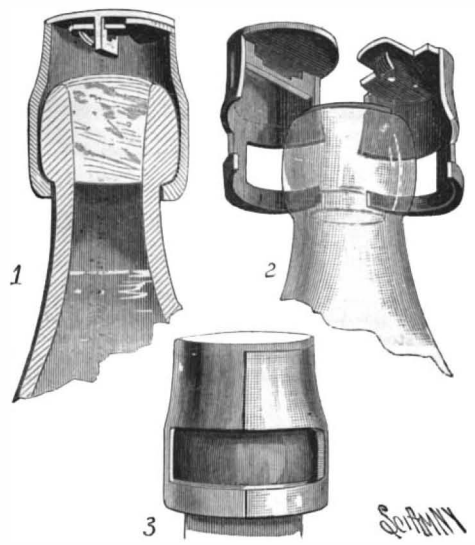
The insanity of fear is both individual and general. The instinct of self preservation becomes the one and only factor in the equation of desperate chances. It gathers strength from resistance, until its own exhaustion and despair strike the balance with death.

All these factors were present in the recent lamentable disaster. The crowd was worn out by excitement, irritated by strained expectation, ignorant of possible danger, hungry, tired and impatient; every selfish interest was intensified by the promise of food and gifts, the struggle for preferment was pronounced, and threatening, the terrible combination of lower human interests was charged to the full and awaited the signal for the inevitable explosion.

It is lamentable to think, in view of subsequent facts, that much might have been done to lessen the magnitude of the disaster, if not to prevent it altogether. As a large crowd is always a dangerous one, the gathering should not have been allowed to attain a magnitude beyond possible control. With sections properly guarded a general and widespread panic would hardly have been possible. There should have been no single point of interest, no distinct focal direction of effort, but rather a judicious distribution of attractions. From all accounts the plain was seemingly large enough to allow space for tables, barbecue fashion, in properly separated places, with a well organized system of rotation feeding and gift distribution, and a consequent prevention of a closely packed and dangerously sensitive mass of struggling humanity. As it is, the deplorable experience in Russia may serve as a useful lesson for the more careful management of all crowds wherever assembled, and not only teach the authorities the urgent necessity for extraordinary alertness in properly preventing panics, but in promptly arresting them by the quickest possible methods of diversion and dispersion.

A NEW NON-REFILLABLE BOTTLE.

A cap designed to be readily placed upon a filled bottle, retaining the cork in such manner that the latter cannot be removed without breaking the cap, is shown in the accompanying illustration, the improvement enabling the manufacturer of a liquor or beverage to protect his bottle from being refilled by others and sold



COLEMAN'S BOTTLE CAP.

again in the original form. A patent has been granted for this invention to Dr. Francis W. Coleman, of Rodney, Miss. Fig. 1 is a view in section and Fig. 3 is a side view of the cap applied to a bottle head, Fig. 2 showing the two parts of the cap before it is applied. The cap is made in two similar parts, each having a flat circular top plate, a pendent semicircular body portion, and jaws or clasps formed on a narrow downward extension of the body. The cap is made of some easily breakable but not readily melted material, and when applied to a bottle head the flat circular top plates overlap each other and lie above the cork, the jaws or clasps embracing the bottle neck just below the head. In order to secure the parts together upon a bottle, one of the parts is made with a downwardly extending thin spring plate, or catch, on the under side of the top plate, adapted to engage a cut out portion of a bar on the under side of the other top plate, by which the parts are locked together automatically on a bottle. This lock is wholly inaccessible from the outside, making it impossible to remove the cork without breaking the cap, and rendering it unfit for further use.

SPITZBERGEN will have a brilliant season this year. The Andree expedition will be followed by a German steamer from Hamburg, which will reach the islands in time to see the balloon start. A Norwegian steamship company will run steamers regularly while the season permits and will put up a temporary hotel on the Eis Fiord. Mr. J. Russell Jeaffreson, of the Geographical Society, will explore the interior of the western island, and if the ice will permit, will try to visit the islands between Spitzbergen and Franz Josef land. Another English expedition, with which went Mr. Trevor Battye, who explored Kolgner, started recently for Spitzbergen. The relieving vessel for the Jackson-Harmsworth expedition, the steam yacht Windward, has just started for Franz Josef land, with provisions and sledges. It will embark live sheep and reindeer in Norway and convey them north. The North Atlantic will be more lively beyond the Arctic circle this year than ever before.

Science Notes.

Earthquake experts propose to establish a number of stations for seismological observations around the earth. Starting from Japan, where is the most complete system for studying earthquakes in the world, the stations will be Shanghai, Hong-Kong, Calcutta, Sydney, Rome, Tacubaya, in Mexico, Port Natal, Cape of Good Hope, Santiago, in Chile, and Rio de Janeiro, all communicating with a central station at Strassburg.

Darwin's suggestion that the composition of subsoils might be ascertained from the examination of the piles of earth brought up by earthworms from their holes is said to have been utilized in Australia by a miner who was led to digging for a coal vein which he found from seeing traces of coal in the accumulations of land crabs; and by another, who, acting upon a hint given him by the wombats, found tin ore in the mountains.

Interviewed on the X rays by a Daily News representative on his return from South Africa, Prof. Crookes said: "The whole of the Roentgen X ray discoveries were made during my absence from England, and although I, owing to my previous work in the same direction, was able to receive the accounts of them without incredulity, yet I assure you that the announcement was as much a surprise to me as to the general public. With regard to the results since published by various British and Continental investigators, you will find that many so-called 'novel effects' and 'discoveries' have been already published by me."

The metallic colored feathers of humming birds and sun birds have been supposed to play some part in the economy of these birds aside from flight; but Miss Newbigin combats this view, pointing out in a paper presented to the Zoological Society of London that in the first place the older view did not apply to all humming birds, as in the metallic feathers of some of them the barbules were often connected by cilia. She held that the very perfection of the flight of humming birds led to correlated variations in feather structure productive of their especially brilliant metallic tints. "The difficulty of the plain colored swifts—possibly near allies of the humming birds—was met by the suggestion that the latter have fewer enemies, and had, therefore, had greater scope of possible color variation."

Dr. Lewy has just made a communication to the Berlin Physiological Society regarding the latest application of the Roentgen rays, says the European editor of the Herald. It has now become possible, he declared, to obtain a complete picture of the internal organs, as regards their situation, size and mechanism. This is accomplished by means of the fluorescent screen. The whole body is lighted up so that the shadow of the various parts and organs is thrown on the screen. Dr. du Bois-Reymond and Prof. Grummach, who had aided Dr. Lewy in his investigations, further reported that they had succeeded in seeing the organs of the throat, the larynx, the tongue and the stomach. Prof. Grummach has further succeeded in making pathological studies of the human body. He examined a man who had formerly suffered from consumption and hemorrhage of the lungs. He noticed that in the part of the body where the lungs lie (the lungs are too transparent to be visible by means of the Roentgen rays) there were a number of opaque spots. These were places where ossification of the tuberculous parts of the lungs had set in. In another case he saw small black lines in the heart of a patient just where the main arteries lie. These showed that the ossification of this part of the heart had set in, although it could not be diagnosed by any of the usual means. The correctness of these observations was confirmed by the fact that the pulse in the wrist was hard to the touch, and signs of ossification could be observed near the elbow and in the forearm.

Some time ago H. Moissan pointed out that zirconium could easily be obtained in the metallic state on reducing zirconia by means of carbon in the electric furnace, and at the same meeting of the Academy of Sciences, Troost described the formation of a carbide of zirconium, ZrC_2. Later experiments by Moissan and Lengfeld have resulted in the discovery of another compound of the same metal with carbon. This carbide, ZrC, was obtained by heating its components in the now celebrated electric furnace, and is described as crystalline and nondecomposable by the action of water up to 100° C. This great stability is in marked contrast to the behavior when exposed to the action of water, of the metallic carbides previously formed, and seems especially curious when it is considered that carbide of thorium—a metal very near to zirconium in Mendeleeff's classification — decomposes readily when acted upon by cold water, acetylene, ethylene, methane, and hydrogen being evolved. Zirconium carbide has a grayish color and metallic appearance, and remains unaltered in both dry and moist air. It scratches glass and quartz easily, but does not affect the ruby. The hydracids attack it readily—hydrofluoric in the cold, hydrochloric at 250°, hydrobromic at 300°, and hydriodic near 400°. At a red heat the carbide burns in oxygen, and in the presence of sulphur vapor a small quantity of sulphide is formed. Ammonia and hydrochloric acid are without action on the new compound, but it is decomposed by nitric and sulphuric acids, while strong oxidizing agents attack it energetically.—Comp. Rend.

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A CARD OF THANKS.

It is with genuine pleasure that we note the continued kind reception of our anniversary number by the press and the public at large; and the more so, as many of our contemporaries have coupled with their approbation of the work a word of greeting for its authors. It would have given us the greatest pleasure to acknowledge these many public and private congratulations in detail. The following are a few among the many journals to whom we wish to extend our thanks for the courtesies received:

New York Herald, New York City.
New York Times, New York City.
The World, New York City.
The Sun, New York City.
The Evening Telegram, New York City.
Science, New York City.
Public Ledger, Philadelphia, Pa.
Journal, New York City.
Illustrated Express, Buffalo, N. Y.
Post, Boston, Mass.
Journal of Commerce, New York City.
Home Journal, New York City.
The Independent, New York City.
The Boston Herald, Boston, Mass.
Financial Review, New York City.
The Newspaper Maker New York City.
American Shipbuilder, New York City.
News, Newport, R. I.
Journal, Orange, N. J.
News, Shamokin, Pa.
Herald, Reading, Pa.
Advocate, Stamford, Conn.
Long Island Democrat, Jamaica, L. I.
Jewish Messenger, New York City.
Coal Trade Journal, New York.
Sunday Call, Easton, Pa.
Sentinel, Easton, Pa.
New London Daily Globe, New London, Conn.
Hasbrouck Heights News Letter, Hasbrouck Heights, N. J.
Times, McKeesport, Pa.
The Goshen Democrat, Goshen, Orange Co., N. Y.
St. Johnsville News. St. Johnsville, N. Y.
The Morning Union, Bridgeport, Conn.
The Journal, Atlantic Highlands, N. J.
The Daily Cataract, Niagara Falls, N. Y.
The Irwin Standard, Irwin, Pa.
Shoe and Leather Reporter, New York City.
The Hammondsport Herald, Hammondsport, N. Y.
The Clinton Courier, Clinton, Oneida Co., N. Y.
Le Courrier de l'Ouest, Chicago, Ill.
The Manheim Sun, Manheim, Pa.
The Summerside Journal, Summerside, Prince Edward Island.
The New Jersey Mirror, Mount Holly, Burlington Co., N. J.
Morning Tribune, Altoona, Pa.
The Ohio Democrat, Logan, O.
The Salamanca Daily News, Salamanca, N. Y.
Crawford County News, Bucyrus, O.
Ovid Independent, Ovid, N. Y.
Lebanon Daily Times, Lebanon, Pa.
Iron Age, New York City.
The Religious Herald, Hartford, Conn.
The Agitator, Wellsboro, Pa.
The Westmoreland Democrat, Greensburg, Pa.
The London Semi-Weekly Enterprise, London, Madison Co., O.
Fishkill Weekly Times, Fishkill, N. Y.
American Machinist, 256 Broadway, New York City.
Baltimore Journal, Baltimore, Md.
Evening Express, Lockhaven, Pa.
Burlington Daily Free Press, Burlington, Vt.
Trenton Sunday Advertiser, Trenton, N. J.
The Evening Press, Greensburg, Pa.
The Crawfordsville Journal, Crawfordsville, Ind.
Binghamton Democrat, Binghamton, N. Y.
Clearfield Republican, Clearfield, Pa.
Sandusky Democrat, Sandusky, O.
The Times, Port Royal, Pa.
The Tri-Weekly Journal, Susquehanna, Pa.
Daily Press-Knickerbocker, Albany, N. Y.
The Enquirer, Cincinnati, O.
Colman's Rural World, St. Louis, Mo.
Evening Capital, Annapolis, Md.
Daily Union, Schenectady, N. Y.
The Advertiser, Huntington, W. Va.
Orange Leaves, Orange, Mass.
Public Opinion, New York City.
The Congregationalist, Boston, Mass.
American Grocer, New York City.
The Varnville Enterprise, Varnville, Hampton Co., S. C.
The Herald, Coeymans, N. Y.
Daytoner Volks-Zeitung, Dayton, O.
The Carleton Place Herald, Carleton Place, Lanark Co., Ont.
Ballston Daily Journal, Ballston Spa, N. Y.

NEW YORK TIMES.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN, which has just been issued, is an interesting publication. It consists of seventy-two handsomely printed and illustrated pages, and comprises a most interesting review of the progress of the arts and sciences in the last half century.

Some of the subjects treated in the number are: The transatlantic steamships, railroads, and bridges, physics and chemistry, the progress in printing, iron and steel, the phonograph and telephone, naval and coast defense, the sewing machine, electric engineering, the locomotive, photography, the telegraph, telescope and the bicycle.

The original ocean steamships and the present transatlantic passenger steamships are contrasted in pictures, and the first railroad locomotives are shown in contrast with the present powerful machines.

NEW YORK EVENING TELEGRAM.—In the birth of the fiftieth anniversary number of the SCIENTIFIC AMERICAN the world of literature and science is materially benefited.

From an artistic standpoint the paper is equally a success. Its covers are handsomely engraved and the seventy-two pages reviewing the progress of the arts and sciences during the last half century are profusely and tastefully illustrated.

NEW YORK HERALD.—In the way of periodicals, nothing of more permanent value has recently been issued than the fiftieth anniversary number of the SCIENTIFIC AMERICAN (Munn & Company). This gala number contains seventy-two pages, handsomely printed and profusely illustrated, comprising not only a history of the periodical from its inception to the present day, but a summary of all the various achievements in the great inventive era with which its existence is coeval.

THE JOURNAL OF COMMERCE, NEW YORK.—Munn & Co.'s SCIENTIFIC AMERICAN celebrates its fiftieth anniversary by the publication of a very handsome number in which is reflected that marvelous mechanical progress of the past half century which the SCINTIFIC AMERICAN has so well recorded, and to which it has contributed so much. Steam transportation on land and sea was in its infancy in 1845, electricity and photography and industrial chemistry were in their earliest stages. The making of steel has been revolutionized in this half century, and other metallurgical and the textile processes have been changed almost as much. This anniversary number of the SCIENTIFIC AMERICAN affords an admirable survey of the changes wrought by the most remarkable fifty years in the world's history, changes a large proportion of which originated in the United States. During this half century the SCIENTIFIC AMERICAN has been one of the most valuable disseminators of scientific knowledge, as well as one of the most faithful recorders of scientific progress.

AMERICAN GROCER.—The fiftieth anniversary of the SCIENTIFIC AMERICAN is marked by the issue of a grand number, handsomely illustrated and bound in a rich enameled cream cover, the design on which illustrates the most marked scientific achievements of the half century. Fac-similes of the first issues of the SCIENTIFIC AMERICAN occupy the first page. . . , The number is illustrative of the progress made during the life of the SCIENTIFIC AMERICAN, showing by pictures and text the wonderful changes wrought in the building of steamships, locomotives, electrical apparatus, etc. . . We tender congratulations to our contemporary, with the wish that it may carry with it during the next half century the same spirit of zeal in the cause of science, mechanics, chemistry and manufactures as has marked its first half century of endeavor. Those of our readers who would know more fully the scientific record of the past fifty years should procure from Munn & Co. a copy of this notable anniversary number, and preserve it for future reference as an heirloom.

THE CINCINNATI ENQUIRER.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN, published by Munn & Co., has just been issued from the press. It contains seventy-two pages of matter of great interest to every scientist and artisan, the review of the progress of arts and sciences during the past fifty years, being the crowning feature of a marvelously complete publication. The SCIENTIFIC AMECICAN is the recognized authority in its rapidly growing field, and is indispensable to those who would keep abreast of the times in industrial science.

ANNAPOLIS EVENING CAPITAL.—In commemoration of the fifty years of existence of the firm, the proprietors of the SCIENTIFIC AMERICAN, Munn & Company, have issued a special number of the SCIENTIFIC AMERICAN. We have the number before us, covering seventy-two pages with very numerous illustrations, some of exceeding interest, as being reproductions of what were scientific notabilities of former days, others relating to subjects of modern or of immediate interest. . . It is, of course, impossible to suppose that the advance of the last half century, almost worthy to be called greater than the progress of all preceding ages, could be presented within the limits of an encyclopedia; but the work on this issue of the SCIENTIFIC AMERICAN appears to have been very carefully done, and no pains seem to have been spared to make it cover its ground.

ORANGE ENTERPRISE.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN is another triumph for illustrated American journalism It is a seventy page number in dainty covers of blue and gold and contains beautifully and completely illustrated articles on the progress of all the leading American inventions. It is a valuable addition to the industrial history of our country and should be in every schoolroom.

NEWBURG JOURNAL.—The current number of the SCIENTIFIC AMERICAN is notable and worthy of preservation as part of any well stocked reference library. This issue is commemorative of the fiftieth anniversary of the publication of the paper by its present owners, Munn & Company. It is an enlarged number, the keynote of which is "the progress of invention during the past fifty years." And well have the publishers accomplished that which they set out to do. Concise and interesting descriptive matter embellished by hundreds of illustrations, combined to present a particularly valuable record.

PHILADELPHIA PUBLIC LEDGER.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN is an exceedingly valuable issue of that always valuable periodical. All of its readers who have any interest in the history and statistics of invention will preserve it for future reference, for it is rich in the line of useful information.

ORANGE, N. J., JOURNAL.—The SCIENTIFIC AMERICAN celebrates its fiftieth anniversary this week by issuing a most elaborate and interesting number. The cover is a beautiful work of art, and the contents are extremely interesting, with many fine illustrations.

THE INDEPENDENT.—The jubilee issue of the SCIENTIFIC AMERICAN, celebrating the fiftieth anniversary of its establishments is not merely a beautiful number, but very instructive. It take, up the various scientific and industrial departments in which great progress has been made during the last half century, and tells their story. It is a number to be read and preserved with care.

BUFFALO EXPRESS.—A notable anniversary publication is the special number of the SCIENTIFIC AMERICAN just out, celebrating the fiftieth birthday of that very useful and successful journal. This nnmber contains reviews of the progress made in the last fifty years in the sciences and the arts, gives historical sketches of some of the most notable inventions made during this period. . . . The anniversary number is provided with a characteristic cover and is printed in handsome style.

BOSTON POST.—Some excellent reading in the way of history in scientific progress is found in the fiftieth anniversary number of the SCIENTIFIC AMERICAN just published. The illustrations of the primitive and modern steamships, in printing and in other triumphs of science are of the deepest interest.

CHESTER (PA.) TIMES.—It was fitting that a paper whose range of subjects is so extensive should devote its semi-centennial number to a review of scientific and industrial developments during the past fifty years, and Messrs. Munn & Company are to be congratulated on the discriminating judgment with which this ambitious work has been carried out.

In a review of this kind the difficulty is so to select, condense and express the essential facts of the subject that the result shall be a reference book and a readable story in one. In the number before us the writers have achieved this result to a marked degree; the historical interest and the literary style of the articles being equally good. . . .

The subjects, which have necessarily been crowded out of the illustrated columns, are more briefly noted in a very readable article at the commencement of the paper, and not the least interesting feature is the admirable essay on the Progress of Invention During the Past Fifty Years, which won the $250 prize offered by the editors for the best essay on the subject.

READING HERALD.—The SCIENTIFIC AMERICAN, the best known of the popular scientific journals of the day has just celebrated its fiftieth anniversary of publication by issuing a large special edition superbly gotten up. The greater part of the edition is taken up with a review of the progress of science and invention in the various departments during the fifty years of the publication's existence. . . . . A perusal of the contents of this number gives one a new idea of the wonderful achievements and the application of scientific principles to commercial uses during the comparatively short period since the periodical began publication. The SCIENTIFIC AMERICAN has been most useful during this time in promoting invention and progress, and in disseminating popular information with regard thereto.

DAILY ADVOCATE (Stamford, Conn.)—Fifty years of uninterrupted publication and a wide circulation among the American people have rendered the SCIENTIFIC AMERICAN, New York, a a household term. The editors have issued a handsome anniversary number, which reviews the progress of arts and sciences during the past half century, and is enriched with copious illustrations. It includes portraits and sketches of celebrated inventors and men of science, and the full text of the prize essay on the Progress of Invention.

DAILY TIMES (Norristown, Pa.) – . . . The many articles are thoroughly technical, and they are written in a racy and popular style, which makes the whole volume—it is nothing less, being equal to a book of 442 ordinary pages—thoroughly readable. It is inclosed, for preservation, in a handsome cover, and is sold at the price of 10 cents.

HOME JOURNAL.—The fiftieth anniversary number of that famous technical weekly, the SCIENTIFIC AMERICAN, is in every respect what was anticipated—an elaborate, brilliant, and accurate resume of the wonders of science in every department during the last half century, including a prize essay on "Inventions of the Past Fifty Years." It is a valuable issue, and worthy to be preserved alongside of the semi-centennial of the Home Journal, issued a few months ago.

WALTHAM (Mass.) DAILY FREE PRESS.—To commemorate its fiftieth anniversary, the SCIENTIFIC AMERICAN has made its issue of July 25 one of extraordinary interest, value, and artistic merit. This number contains over forty pages and reviews by copiously illustrated and well written articles the progress made during those fifty years.

A prize of $250 was offered by the publishers for the best essay on the subject of the progress of invention during the past fifty years. Essays of excellent quality were produced, and that receiving the prize is published in this issue.

LONG ISLAND DEMOCRAT (Jamaica, L. I.)—The SCIENTIFIC AMERICAN has reached the mature age of fifty years. It is, therefore, with commendable pride that its editors and proprietors have prepared a special anniversary number with four times the usual number of pages to celebrate the occasion. This number contains reviews of the progress made in the last fifty years in the sciences and the arts, gives historical sketches of some of the most notable inventions made during this period and is filled with interesting illustrations.

STRATFORD EVENING HERALD.—Our acknowledgments and greetings are due to the SCIENTIFIC AMERICAN, the receipt of whose anniversary number reminds us that our esteemed contemporary has completed the first half century of its existence. . . . . The illustrations appear to have been chosen with a strict regard for their historic interest and readers will linger longer over such reviews as those of the American-built steamer Arctic, the fastest vessel on the Atlantic in 1852, Morse's pendulum instrument of 1837 and his telegraph receiver of 1844, Edison's first phonograph, the Patent Office models of Howe's and Wilson's sewing machines, the first "safety" bicycle, the first McCormick reaper, the original Franklin hand press, cuts of the early forms of the telephone and electric motor, and many another engraving of historic interest.

JEWISH MESSENGER.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN is to be welcomed. It contains a prize essay by Edward W. Byrn, of Washington, on the progress of invention during the last fifty years, and articles on the various chief subjects of inventive thought by competent writers. Its illustrations of "then and now" are interesting and illuminating.

TYRONE (PA.) DAILY HERALD.—The golden anniversary of an American technical journal is not so common an event, but it calls for special notice and a warm word of fraternal greeting. The receipt of the handsome semi-centennial number of the SCIENTIFIC AMERICAN, of New York, gives us the opportunity to congratulate this long eseablished and justly esteemed journal of its golden anniversary and the effective and characteristic manner in which it has signalized it. For fifty years our contemporary has devoted itself to a weekly chronicling of the world's progress in science and industry. In a review covering so wide a range it was evidently impossible that even in an issue of seventy-two pages to treat every subject in detail, and we think that, on the whole, the selection has been judiciously made.

WATERBURY (CONN.) AMERICAN.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN is a most interesting and valuable one, describing, as it does, the evolution and development of modern invention during the past half century. Illustrations of early forms of the printing press, the telephone, the locomotive, the steamboat, the sewing machine and other inventions are given and contrasted with the present articles of the same kind, and descriptions of the progress of inventive genius are scattered plentifully through the beautifully printed pages. The offices of Munn & Co. with their staff of workers thirty years ago are shown as well as those of to-day. The cover of this number is a work of art in itself, and will repay careful examination.

SUNDAY CALL (Easton, Pa.)—The SCIENTIFIC AMERICAN, of New York, has signalized its fiftieth anniversary by the publication of a very handsome seventy-two page special number, which consists of a review of the development of science and the industrial arts in the United States during the past fifty years. It was an ambitious undertaking, and the work has been well done.

NEW LONDON DAILY GLOBE.—The fiftieth anniversary number of the SCIENTIFIC AMERICAN is a splendid number, a storehouse of information to mechanics and inventors. Its intrinsic worth is ten times its cost.

THE COAL TRADE JOURNAL (New York).—The fiftieth anniversary number of the SCIENTIFIC AMERICAN reviews the progress of the past fifty years in the various sciences and industrial arts, and the various articles by the best scientific writers of the day are racily written and richly illustrated. The editors have accomplished the difficult task of presenting a compendium of information that shall be at once historical, technical and popular. The interest never flags for a moment, and the story of a half century's growth is in itself a veritable compendium of valuable scientific information for future reference.

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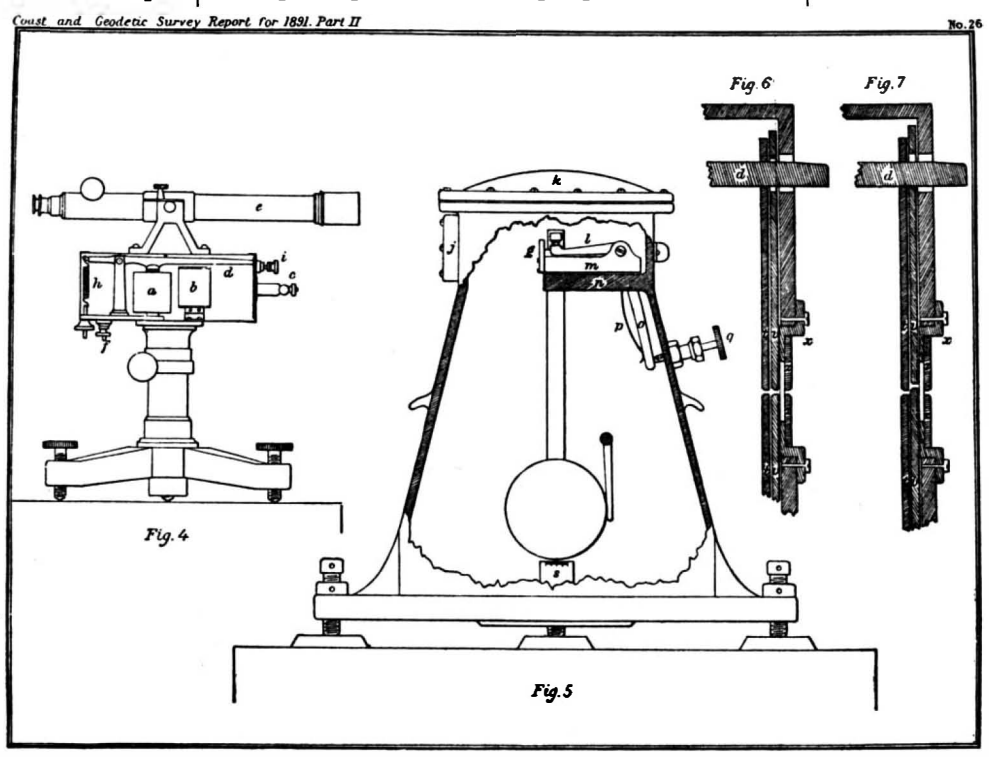
DETERMINATIONS OF GRAVITY.

With the earlier instruments used in gravity determinations, the labor involved in their use was so great that investigations were neglected for half a century. These investigations have been revived within a few years. A short pendulum, one-quarter meter in length, was first employed by Lieut.-Col. Von Sternick, in Austria. Commandant De Forges developed a one-half meter pendulum a little later. More recently Dr. T. C. Mendenhall, superintendent of the United States Coast and Geodetic Survey, designed a one-half second pendulum, which has been much used. In fact, pendulums of this kind have been used in all the recent investigations of the survey. It is by prolonged, patient and careful investigation that the earth's figure is being determined by ascertaining the force of gravity at different points on the earth's surface by means of this pendulum in connection with other apparatus.

This interesting apparatus is shown in the annexed engravings, in which Fig. 1 represents the pendulum inclosed in an air-tight chamber, the flashing apparatus, observing telescope, the vacuum pump for reducing the air pressure in the pendulum chamber, and the chronometer for controlling the electric circuit so as to produce a flash at stated intervals.

Three pendulums constitute a set. If discrepancies appear in the results, the one at fault may be detected. Each pendulum is designated by a letter, showing the set to which it belongs, and its individual number. The pendulums are made of an alloy of aluminum 10 per cent and copper 90 per cent, a composition which has a very high resistance to corrosion. The pendulums are highly polished, but not lacquered. Each weighs approximately 1,200 grammes, and is about 248 millimeters in length from the center of the bob to the knife edge. The stem and bob are designed so as to offer little resistance to air when in motion. The bob is solid and is 9 centimeters in diameter and 4·5 centimeters thick at the center, its faces being spherical surfaces. The knife edge is a continuous piece of agate passing through the head of the pendulum and firmly secured to it. The edges are formed by the meeting of carefully ground faces at an angle of about 110°. These edges bear upon agate planes, on which the pendulum swings. The two pieces of agate forming these planes are rigidly embedded in a heavy brass plate, m (Fig 5). A small mirror is set in each side of the pendulum head. These mirrors are carefully adjusted, so that from any of the pendulums with either face front, the image of the slit will be reflected into the same portion of the field of the observing telescope. These pendulums are handled with great care, a double jointed handle being provided for lifting them from the case in which they are carried, and placing them in position in the air-tight chamber.



RECEIVER AND FLASH APPARATUS PARTLY IN SECTION.

In the flash light apparatus a light metal box is mounted on a stand having both vertical and azimuthal movements, and clamps, and carries above an ordinary observing telescope, which may be focused for objects as near as four feet (Fig. 4). This box contains an electro-magnet, a, whose coils are connected with a chronometer circuit through the binding post, f, and whose armature carries a long arm, d, projecting through an opening in the end of the box. This arm moves two shutters, t and v, which are arranged to emit a flash of light from the box when the circuit is broken, but not when it is closed. The light passes through slits in the shutters and through a slit in the end of the box when the several slits coincide. The light for the flash is furnished by a small oil lamp attached to one side of the box, the light from which is reflected by a mirror in the box, and concentrated by a lens on the slit. After placing the apparatus upon its support, which may be a rock or a pier, the chamber is leveled and the pendulum is put in position. The cap is placed on the chamber, the air pump is attached, and the pressure in the chamber is reduced to about 50 centimeters, as indicated by the manometer on the side of the chamber. The chamber is provided with a starting lever, by means of which the pendulum is carefully drawn aside and allowed to rest for an instant. Then, as nearly as possible in coincidence with the beat of the chronometer, the external arm of the lever is pushed back to its place, thus leaving the pendulum free to vibrate through the desired arc.

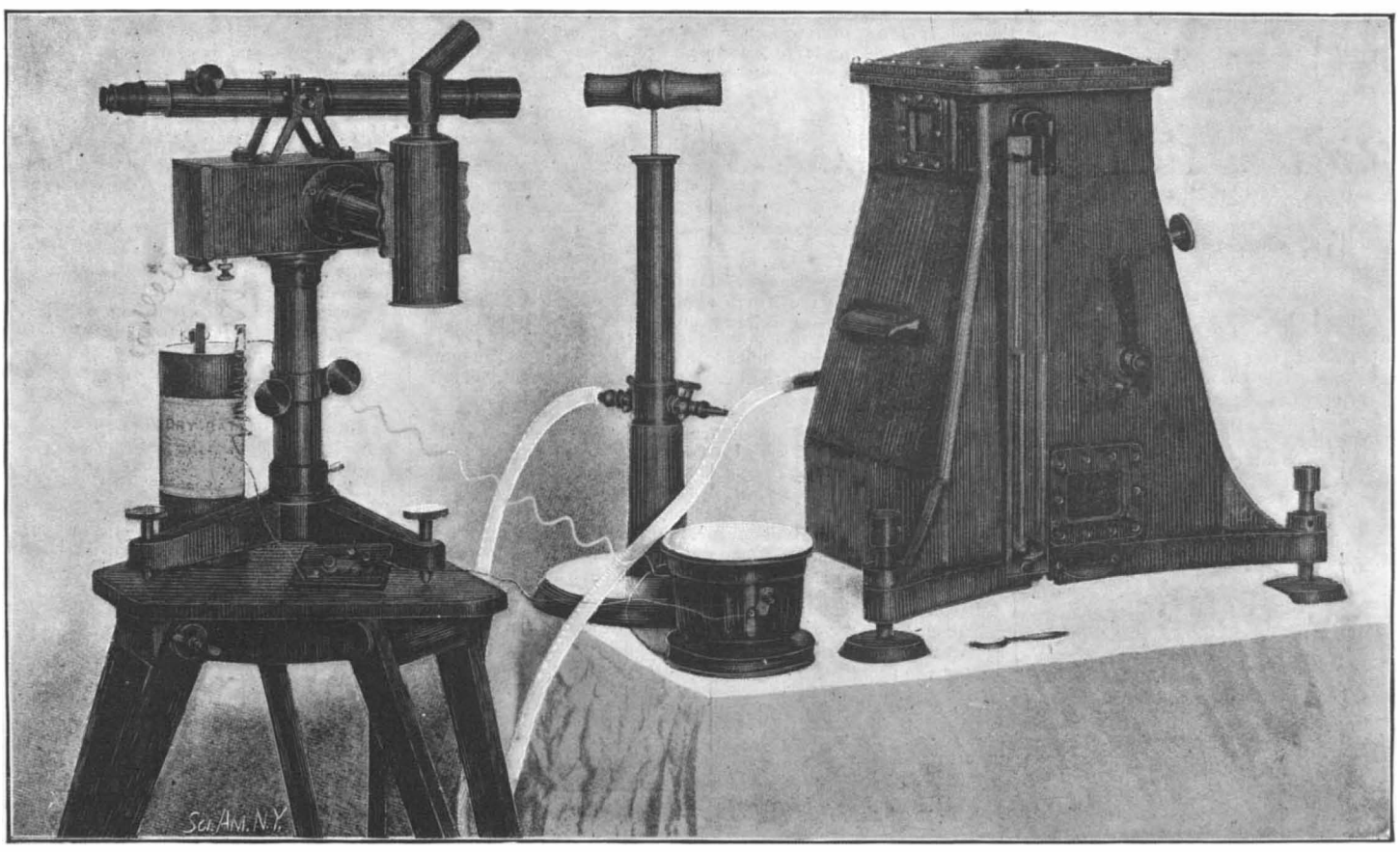
The pendulum is capable of continuing its vibration for twenty-four hours after receiving an impulse, but four hours is sufficient for any observation.

A small mirror is placed on the pendulum support parallel and as near to the mirror on the pendulum head as possible without interfering with the motion of the pendulum. The flash apparatus is placed one or two meters from these mirrors and in a line normal to them. A flash of light is produced every second, as determined by the break circuit chronometer. When properly adjusted, the flash is reflected from both mirrors, and assuming the pendulum to be at rest, two lines of light are seen as one in the telescope. Now, suppose the pendulum to be in motion, the flash which occurs for an instant each second will be reflected from the moving and stationary mirrors. If the movable mirror should happen to be in the plane of its original adjustment when the flash occurs, the appearance in the telescope will be precisely the same as when the pendulum is at rest. If the period of the pendulum be precisely one-half that of the chronometer, it will return to this position in just one second, and the appearance will be continually repeated. If, however, the pendulum be slightly slow or fast in relation to the chronometer, the mirror will not be precisely in this position at the end of one second, and the image from the mirror will be a little above or below that of the image from the stationary mirror. In another second the distance separating them will be still greater, and this will go on until the moving image is no longer seen in the field of the telescope. After a time, however (say five minutes), the pendulum will have gained or lost one oscillation on the beat of the chronometer, and a few seconds before the period for this has elapsed, the image reappears in the field and approaches coincidence, to again recede on the other side.

It is only necessary to observe the instant of this coincidence of the two images. After having ascertained the "coincidence interval" and observed the first coincidence, the happening of any one in the future can be quite closely predicted. An error of one second made in observing the coincidence either at the beginning or end of the swing will produce in the result an error less than one part in 2,500,000. It has been found possible to get a fair rate from an observation from a single pair of coincidences, the time consumed being less than five minutes.

The rate of the chronometer is checked by frequent astronomical observations, and the variations of gravity are determined by the comparison of the pendulum vibrations with the flashes controlled by the chronometer, as already described.

Measurements of the force of gravity relative to the base station, Washington, were made at twenty-six stations, the field work occupying one hundred and fifty days.*



HALF-SECOND PENDULUM APPARATUS.

An Electric Chronograph.

An electric chronograph, on which Profs. Crehore and Austin have been working for some time, was put into operation recently in the races of the Interscholastic Association, of Boston, says the Electrical Engineer. The clock records the time from the report of the starting revolver to the breaking of the tape. Falling weights set in motion a heavy frictionless, rotating wheel. The record of time is made by a pencil on a roll of paper wound about the shaft cylinder. The explosion of the pistol releases the weights and sets the wheel in motion, and at the same time presses the lead on the paper. When the winner breaks the tape, the circuit is made and broken, and the pencil point makes a notch in the record. The instrument is calibrated by an astronomical clock, the recorded revolutions all read by tables and the time deduced in seconds and fractions with the greatest possible accuracy.

* For the information here given we are indebted to the report of Dr. T. C. Mendenhall and a paper read before the Philosophical Society of Washington by George Rockwell Putnam.

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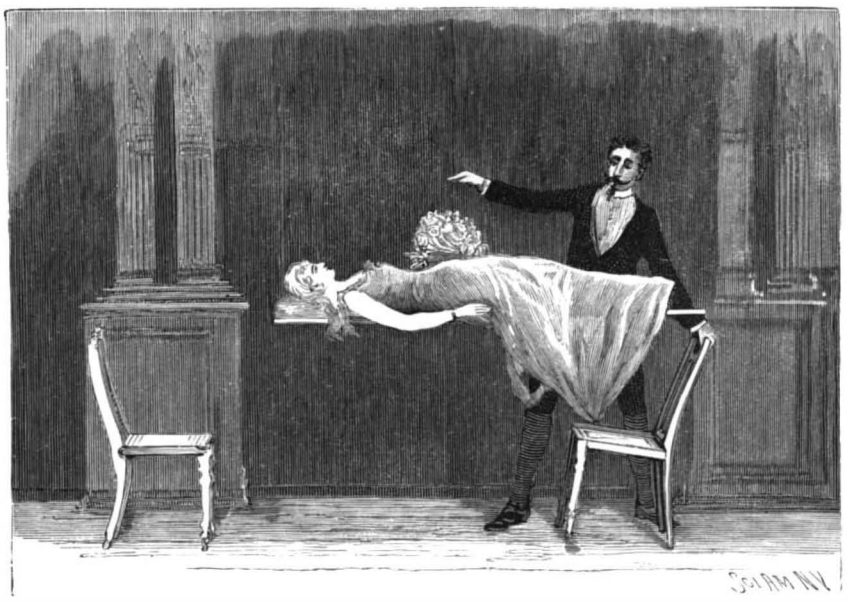
THE ILLUSION OF TRILBY.

Hermann has now won for himself a firm place in the regards of the civilized world, he representing the fin de siecle Houdin. His carefully executed work, with its perfect detail and finish, is a standard among performances of natural magic, and other exhibitions are referred to it as the gage of their quality. We have described in our columns a number of illusions as shown on the boards of the theaters and music halls, many of which exhibitions by their ingenuity have seemed worthy of illustration. The present article is devoted to Hermann's illusion "Trilby," in which hypnotism is supposed to play a part. As will be seen, it is really an ingenious application of mechanics.

PREPARING TRILBY'S COUCH.



THE AERIAL SUSPENSION OF TRILBY.

A plank is placed upon the backs of two chairs. A lady performer who is supposed to represent Du Maurier's "Trilby" enters and, stepping on a footstool, lies down upon the plank. She holds a bouquet in her hand, which bouquet, unknown to the audience, has its own part to play. The other performer, Hermann, who is supposed to be Svengali, carefully arranges the drapery, walking around her as he does so. Then he makes somes passes, and one by one removes the chairs, and the lady and board remain in the air. In response to his passes the lady, still resting on the board, rises, and the position changes to an inclined one and back to the horizontal one. Finally the chairs are replaced, the lady by passes is supposed to be waked from her trance and steps down, chairs and plank are removed, and nothing is to be seen further.

Two of the cuts show the progress of the performance as seen by the audience. The third cut explains the mechanism. Behind the scene is a strong frame, up and down which a movable slide works. Tackle is provided to raise and lower the side; and a workman behind the scenes is intrusted with its manipulation. A bar carrying at its rear end handles, and in front a socket, shown in the upper right-hand corner of the same cut, is journaled in the slide, and can also be thrust in and out through the journal box.

When Trilby has been placed upon her board couch, the bar is thrust forward, drapery at the back having hitherto concealed its socket end. The fair Trilby with her bouquet now effectually conceals it as it emerges from behind the curtains. The performer, while apparently sedulously arranging the drapery, guides the socket and causes it to grip the board. The assistant behind the scene pulls upon the tackle and works the handle, so that Trilby's weight leaves the chairs one by one, which are removed, and, supported by the bar, she seems to float in air. By manipulating the tackle she can be raised and lowered. By the handles she can be tilted about, giving a wonderfully good effect. Finally the chairs are replaced, and the assistant lowers Trilby upon them. During the waking passes the socket is detached and the bar is withdrawn. A close observer may notice a slight agitation of the drapery or curtains behind the stage as the bar is pushed out and withdrawn, but the attention of the audience in general is so taken up with the performance proper that this disturbance is overlooked by them.

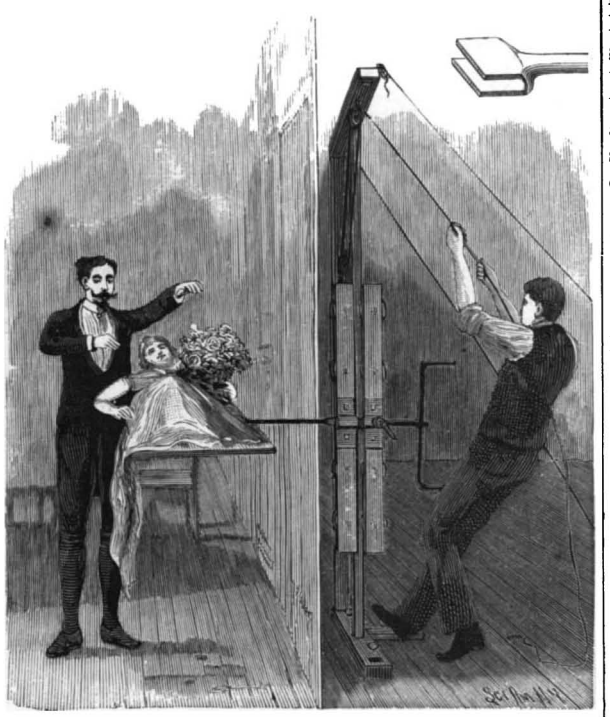
The magician, it will be seen, can only walk completely around the reclining lady before the bar is in place or after it is withdrawn. When the bar is in place, he can walk behind her, but cannot go completely around her. Hence his complete excursions are restricted to the time when she is resting on the chairs, before the bar is in place or after it has been withdrawn.

After the board is vacated, Svengali throws it down upon the stage, its fall, with accompanying noise and disturbance, showing that there is no deception about that portion of the display.

THE engraving of the lord mayor's coach, which appeared in our last issue, should have been accredited to The Hub, one of the best papers devoted to carriage building published at home or abroad.

Wonders of Venetian Glass.

Among the lagoons, nearly due north of Venice, in the island of Murano, there live a race of men who seem to have a great future, says the London Globe. They are the descendants of the old Venetian glass-workers, and of late years they have been reviving the ancient art, which made Murano famous in the past, of glassblowing. The old Venetian glass was what is commonly called blown, but the name gives a very small idea of the manufacture. Glass has certain characteristics which give its true beauty and value for art purposes, and though you may neglect these and force it to take forms utterly foreign to its nature, you are producing not works of art, but monstrosities. Whatever glass may be, it is in its natural state not crystalline, so that nature is outraged when we grind it into sharp angular forms that belong rather to other materials. The old Venetian glass was light, bright, vitreous in appearance, and stained with the richest possible colors, and all these qualities are retained in the newly revived manufacture at Murano. There is one more strong point in favor of glass blown and worked over that moulded—namely, that every individual piece is an original work of human art, and as it is almost impossible that any two should be exactly alike, unless their form is very simple indeed, the buyer chooses according his fancy, and is sure that no one else possesses a piece of exactly the same size and shape. In the manufacture of the ordinary cut glass, minium (red lead) is frequently added to increase its brightness, but this destroys at once the characteristic lightness and causing it to cool more rapidly, quite prevents the possibility of working it in the proper ductile and malleable condition. The Murano material is worked as the ancient Venetian glass made on the same island used to be, and all the old methods have been discovered, or at least the same effects have been produced. The fiamma, perhaps more strange than beautiful, the millefiore, the smelze, including perfect imitations of agates, chalcedons, lapis lazuli, etc., for mosaic, the aqua marina, rich ruby colors, the brilliant aventurino, all are here, and many other kinds of work, some of which are imitations of the old glass, and some new inventions.



THE ILLUSION EXPLAINED.

The tools used are a hollow reed of iron, a few instruments like shears, of different sizes, and a stamp with a strawberry shaped die. The end of the rod is dipped in molten glass of, say, ruby color, and a portion accumulated on its end. If too much or too little is taken, the wine glass will not be of the right size, and if the metal, as it is called, is not of the right temperature, the color will be too dark or too light. The lump is rolled on a table into symmetry and heated again. A few turns of the rod and a breath or two through it, and a hollow ball appears at the end. One extra puff of the breath, and the bowl would be too large and too thin. A boy brings up a small portion of white glass, which he has picked out of another reservoir, and blown hollow. This must be so hot as almost to drop off the rod, and must be ready at the exact moment. He touches the bowl with it, and the two adhere like sealing wax. A pull asunder and one dexterous twist forms the stem of the wine glass, upon which three little lumps of glass are then stuck and stamped as strawberries, and the whole is again introduced into the furnace, where it would instantly droop out of shape but for the deft manipulation which it undergoes. By the time it is heated, the boy is ready with another globe of glass, perhaps of a different color, which he causes to adhere to the bottom of the stem. The man spins it around between his shears, nipping part of it almost off, and thus gaining the right quantity of metal for the foot, no less and no more. One tap on an iron ledge breaks off the superfluous piece, and leaves a small hole at the point of fracture. Once more the action of the fire is called in to soften the brittle material, and when the pearshaped end comes out the points of the closed shears are introduced to widen the opening into a cup-like form. A small lump of avventurino is by this time on the end of the boy's rod, melted, and only saved from dropping by his dexterity. One touch and it adheres to the end of the cup just formed. He pulls it out and winds it around, adhering as it goes to the edge. Again the fire does its duty, and then the artist finishes the form of the foot, detaching immediately the bulb at the top from his hollow rod. Another rod, with a molten piece of glass, is prepared for him by the boy's ready co-operation, and is pressed against the center of the foot, to which it adheres. Into the fire goes the whole piece, and when withdrawn the bowl of the glass is partly shaped by the shears, avventurino wound around the edge as before with the foot, a last heat, and with artistic care the delicate, crocus-like bowl, some day to contain the sparkling wine, is completed.

Observing the Eclipse.

Advices received July 19 from Japan say the expeditions to take observations of solar eclipses are reaching Japan. The steamer Coronet, with United States observers, reached Yokohama on June 22. Among the party were Capt. and Mrs. A. James, Prof. and Mrs. Todd, Chief Engineer Pemberton, U. S. N.; E. A. Thompson, Chief Astronomical Mechanic; Mr. Gerrish, of Harvard University, Frank Thompson, Assistant Astronomical Mechanic; Dr. Adriance, and A. W. Francis. On the Island of Yezo the eclipse will begin at 3:05 on August 9 and will last two minutes and forty seconds. It is proposed to establish a large equatorial mount which will have twenty-five instruments pointed at the sun and which will be operated automatically by electricity. The instruments will take between 500 and 600 negatives of the corona. Prof. Schaeberle, of Lick Observatory, California, arrived a week before the Coronet. The French scientific party came about the same time, and the party of English astronomers is expected in three days. Prof. Schaeberle goes to Akkesh and Prof. Todd to Mobetsi.

CONSCIENCE AND HEALTH.—He that loses his conscience has nothing left that is worth keeping. Therefore, be sure you look to that. And in the next place look to your health, and if you have it, praise God, and value it next to a good conscience, for health is the second blessing that we mortals are capable of—a blessing that money cannot buy. I therefore value it, and be thankful for it.—Izaak Walton.

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Changing Seed Wheat.

BY F. D. COBURN, SECRETARY KANSAS DEPARTMENT OF AGRICULTURE.

It is no longer disputed that in ordinary farming the sowing of any given variety of winter wheat continuously on the same land or in the same locality results in its deterioration, both as to yield and quality.

The numerous letters which each season brings this office relative to this condition, and as to the sections from which the most profitable change of seed is likely, render it desirable to publish the views of those having the largest opportunity for observation in such matters, and noting intelligently some of the practical results. No other men are in such close touch with wheat raisers and the wheat interest as the millers, and the tenor of the valuable information secured from them in reply to inquiries is well shown in extracts from some of their letters as follows:

Mr. C. V. Topping, of Enterprise, secretary of the Kansas Millers' Association, writes: "The belief existing among winter wheat growers that sowing the same varieties year after year in the same latitude lowers the yield and quality, is correct. C. Hoffman & Son, extensive millers at this place, last year imported from Russia some of the pure Russian wheat. (This is the Crimean winter wheat, and I would suggest for accuracy and definiteness that the name Crimean winter wheat be used for this Russian variety and that the misnomer 'Turkey' or 'Rice' wheat be discarded.) A number of years ago the same quality of wheat was imported, and by comparing the wheat that has been sown here year after year with that just imported, it shows a very marked difference both in quality and certainly in yield of bushels per acre as well as in the wheat product. The flour from pure Russian wheat is much stronger than that from wheat that has been sown and resown in this country for a number of years. This is very noticeable in European markets, where the Hungarian flours command from 20 cents to 50 cents a barrel more than our ordinary Russian wheat flours. Farmers should change seed certainly every five years, and I consider that it would pay them well to change every three years. For this part of the State (Dickinson county) I would recommend sowing the hard varieties, and in exchanging seed the central part of Kansas could use that grown in either northwestern or northeastern Kansas; but of course where it can be had, the pure Russian seed from the Crimea should be used."

Mr. J. W. Krehbiel, manager of the Moundridge Milling Company, at Moundridge, McPherson county, says: "The nature of our wheat undergoes some change, and it would be very profitable to procure new seed at least every ten years. I think a decline in the original qualities for milling will first be manifested, but as the plant loses its native European hardiness (as the Turkey variety), it will not stand the winter so well and consequently give a less yield. Our locality would want Turkey wheat imported from Russia. Mr. B. Warkentin, of Newton, now has some of this new seed imported, and the use of such should be a great profit to our farmers."

Mr. Warkentin above mentioned, president and manager of the Newton Elevator and Milling Company, Harvey county, says experience teaches him that by sowing the same variety year after year in the same locality, it changes its qualities both as to yield and milling. "Our so-called Turkey wheat is becoming softer from year to year. Of course the growing season has much to do with this. If the wheat can mature without too much rain, the per cent of gluten, which makes it valuable, will be much larger than otherwise. In my opinion our farmers should change seed at least every four or five years, and new seed should be imported from the Crimea about every six or eight years. Farmers should be encouraged to exchange for seed from a distance of say 25 miles, as I have found it a great means of improvement. Our soil and climate seem best adapted for the red, hard winter wheat, with which we can easily compete in the world's markets. I have twice within the past ten years imported fresh seed wheat from the Crimea—the wheat known as the Russian-Turkey, the beneficial results of which are very plainly seen in our country."

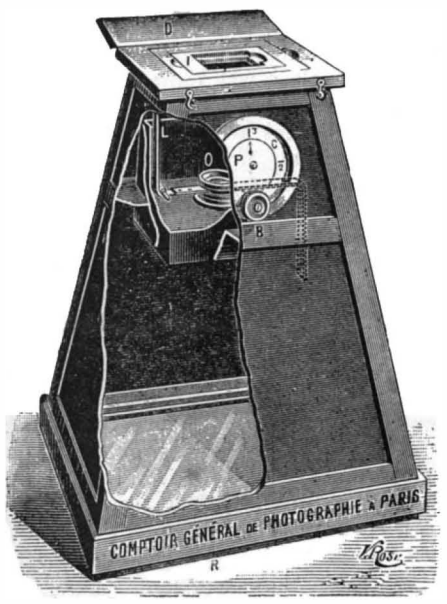
Geo. H. Hunter, president of the Hunter Milling Company, at Wellington, Sumner county, writes: "Our considerable experience and observation is that continuous sowing of the same wheat in one locality is injurious to it. We have tried wheat from other portions of our county and find a change, especially from the north, is beneficial. We would not recommend seed obtained from too great a distance, say not to exceed 150 miles, but it has been our experience that when new seed has been brought in either wheat or corn, the yield has been much better for several years. Generally a poor yield makes a poor product, which is the only complaint we would make as to quality. It is a good rule to change seed at least once every five years."

The Messrs. Colburn, of the Queen Bee Roller Mills, at McPherson, write in substance as follows: "We believe our farmers should change seed as often as once in three or four years; not necessarily to imported seed but to that raised in a different locality. This we believe with the exceedingly good milling qualities of the Russian, or as we term it, 'Kansas Hard,' would hold both the yielding and milling qualities intact for many years. While we are firm believers in changing seed at least once in three years, it is a fact that prevailing climatic conditions make a wonderful difference in the outcome of quality and yield, whether the change is made or not. Everything does not depend upon seed; we have seen the choicest of seed sown, only to produce the meanest wheat, and vice versa. If some of the imported was available each year, it would certainly tend to hold up the reputation we are now attaining in the world's markets on 'Kansas Hard Wheat,' as well as the flour made from it."

Prof. C. C. Georgeson, of the State Experiment Station, at Manhattan, says: "That wheat does deteriorate in the course of years under the care that the average farmer gives his crop I think must be conceded. The yield becomes less, the grain of an inferior quality, and the millers complain that the proportion of bran to flour is too large. From what section it would be most desirable to procure a change of seed cannot be answered positively. In our experience here at the station we have as a general thing had the best results from wheat grown in about the same latitude to the eastward of us. The start for our best yielding varieties came from Virginia, Maryland and Ohio. A variety of superior merit, produced only by selection and culture under the most favorable conditions, can maintain its superiority only when grown and selected with the same care which produced it. Our farmers do not give their wheat that care and culture, and the legitimate result is that it runs out. The main cause of deterioration then is under the control of the farmer himself."

NEW PHOTOGRAPH ENLARGING APPARATUS.

The enlarging of small pictures is one of the most agreeable operations of photography. The new enlarger



SIMPLE PHOTO-ENLARGING APPARATUS.

designed by J. Carpenter has the form of a truncated rectangular pyramid. Its base is formed by a plate holder, with a cover, R, 18×24 inches, and its vertex by a series, I, of kits for holding the negatives, from 9×10 inches to 4½×6 inches. A screen, D, covers them when the apparatus has to be taken into the daylight. In the base frame there is a perfectly smooth glass, 18×24 inches, without ridges or defects. On the inner side of the glass is applied the sheet of gelatino-bromide of silver paper, held in contact with the glass by a little board and a lock or spring at the two ends. The first board, instead of being of one piece, has an intermediate square, thus making it possible to take a photo copy 13×18 inches.

In the interior of this truncated pyramid are lens boards that can be moved upward or downward by the button, B, in the center of which is a rectilinear objective, O, which exactly covers the maximum dimensions of the photograph to be enlarged. At the proper time the other lenses, mounted on a sheet of steel, L, move when the button is operated until they are in focus and are supplied with proper diaphragms.

When the button, B, is moved, it carries with it an exterior disk, P, which carries an arrow placed like one of its radius and which moves concentric with a graduated circle, B, showing the different degrees of focus, for different sized pictures, that may be desired.

Let us rotate the disk so the needle will indicate the figure 4 and at the same time produce a slight noise by an escapement, and it will show that the objective has been automatically located so that the dimensions of the enlarged image will be four times as great as those of the little pictures and the whole of the central part of the little picture will have the maximum dimensions, 18×24 inches.

After the paper is adjusted in position on the base plate in the dark room, the hinged cover, D, is folded over the negatives. The whole apparatus may then be removed into the light and the exposure made by opening the lid, D, for a few seconds.

If it is desired to enlarge on a plate instead of on paper, the former is put in the place of the latter. We believe that the enlarging apparatus to which we refer shows real progress in the practice of enlarging.—La Fotografia Practica.

Rules of the Road at Sea.

Congress has finally passed and the President has approved the bill making amendments to the proposed new rules of the road at sea. It was hoped that the new rules could be proclaimed this summer, but this is now found to be impossible.

It is the intention of the State Department to communicate with all foreign governments, asking that they agree upon some date for the rules to go into effect. It is expected that about March 1, 1897, will be the date selected. When it is agreed upon the President will issue a proclamation. The law as it goes on the statute books is as follows:

Article 15. All signals prescribed by this article for vessels under way shall be given:

"First—By 'steam vessels' on the whistle or siren.

"Second—By 'sailing vessels' and 'vessels towed' on the foghorn.

"The words 'prolonged blast' used in this article shall mean a blast of from four to six seconds' duration.

"A steam vessel shall be provided with an efficient whistle or siren, sounded by steam or by some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient fog horn, to be sounded by mechanical means, and also with an efficient bell. (In all cases where the rules require a bell to be used a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small seagoing vessels.) A sailing vessel of twenty tons gross tonnage or upward shall be provided with a similar foghorn and bell.

"In fog, mist, falling snow, or heavy rainstorms, whether by day or by night, the signals described in this article shall be used as follows. Namely:

"(A) A steam vessel having way upon her shall sound at intervals of not more than two minutes, a prolonged blast.

"(B) A steam vessel under way, but stopped, and having no way upon her, shall sound, at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between.

"(C.) A sailing vessel under way shall sound at intervals of not more than one minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession, and when with the wind abaft the beam, three blasts in succession.

"(D). A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

"(E). A vessel when towed, a vessel employed in laying or in picking up a telegraph cable, and a vessel under way which is unable to get out of the way of an approaching vessel through being not under command, or unable to maneuver as required by the rules, shall, instead of the signals prescribed in subdivisions (A) and (C) of this article, at intervals of not more than two minutes, sound three blasts in succession, namely: One prolonged blast, followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

"Sailing vessels and boats of less than twenty tons gross tonnage shall not be obliged to give the above mentioned signals, but if they do not, they shall make some other efficient sound signals at intervals of not more than one minute.

"Section 2. That said act of August 19, 1890, as amended, shall take effect at a subsequent time, to be fixed by the President by proclamation, issued for that purpose."

Navy Dry Docks in the United States.

With the completion recently of the Port Royal dock on the Atlantic coast and the Port Orchard dock in Washington, on the Pacific, the United States Navy Department now has ten large dry docks completed for war ships as follows:

Location.	Material.	Length	Width Floor.	Water.	
		Ft.	Ft.	Ft.	In.
Boston	Stone.	391	30	27	0
Brooklyn	Stone.	350	30	25	6
Brooklyn	Timber.	530	50	25	6
League Island	Timber.	530	50	25	6
Norfolk	Stone.	360	30	24	0
Norfolk	Timber.	530	50	25	6
Port Royal	Timber.	600	50	26	0
Port Orchard	Timber.	650	50	26	0
Mare Island	Stone.	530	30	28	0

—Marine Review.

THE medical department of the War Office of the British government considers that the Roentgen rays are so practical that two sets of Roentgen ray apparatus have been sent up the Nile to be used by the army surgeons in locating bullets in soldiers and to determine the extent of fractures.

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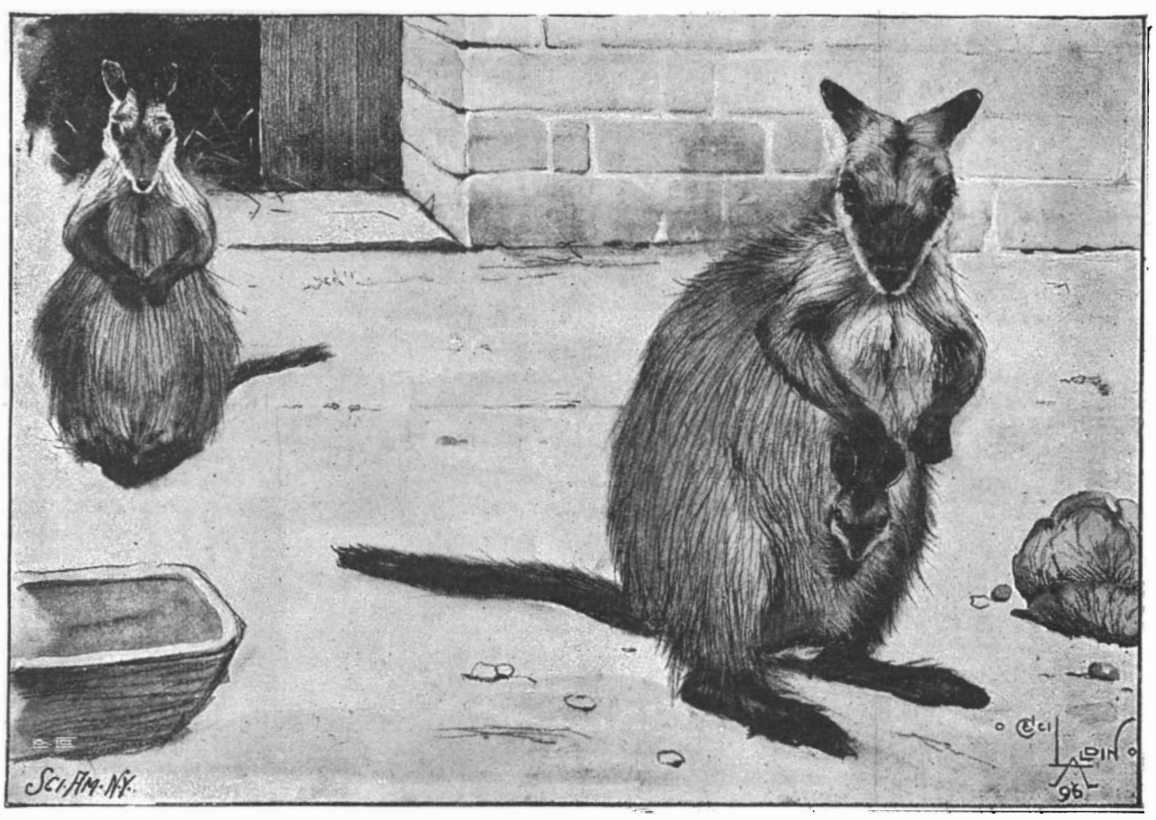
A KANGAROO AT THE ZOOLOGICAL GARDENS, LONDON.

Sundry interesting additions have lately been made to the already representative collection of living birds and animals at the Zoological Society's Gardens in Regent's Park. A fine specimen of the rare Occipital vulture, two specimens of Burmeister's Seriema, some curious Albino peafowl of South African origin, and several bustard quails as to whose exact classification opinions differ, are among the most important of recent recruits to the aviary. These have been acquired by purchase, and therefore, for the average Londoner, a more peculiar interest attaches to the birth at the "Zoo" of the first baby kangaroo of the brush tailed rock species that has yet been brought into the world within its hospitable confines. Up till the present year the animals of this particular species—Petrogale Penicillata—have refused to breed, although the other branches of the kangaroo family have been fairly prolific. The brush tailed rock kangaroo dwells chiefly in rough, rocky country, and is therefore more thick-set in build than many of its cousins, while its sturdy, brush like tail plays an important part in its agile movements. We are indebted for the cuts and copy to the Illustrated London News.



BABY KANGAROO, THE FIRST OF THE BRUSH TAILED ROCK SPECIES BORN AT THE ZOOLOGICAL GARDENS.

"Barisal" Guns in Gippsland, Australia.

BY THOMAS O'BRIEN.

During a residence of several years in the Gippsland district of the colony of Victoria, Australia, while principally engaged in gold mining and prospecting for gold and tin, I have repeatedly noticed those mysterious reports or discharges.

The Gippsland country may be briefly described physically as a mountainous tract of land on the southeastern slope of the Australian Alps. It is fringed on the coast line by a strip of low lying flat land, varying from a mile to fifteen miles in width, dotted with lagoons and indented by estuaries. The mountain ranges rise abruptly, and in places precipitously, from this narrow belt, and are broken at frequent intervals by deep and rapid watercourses, flowing generally southeasterly to the Indian Ocean. Geologically it consists, at the southern extremity (Wilson's promontory), of an immense granite upheaval, with an adjacent stratum of marble at the extreme southern point; to the north of the promontory the granite is overlaid successively by rocks of the Upper Silurian period, old Devonian sandstone, broken coal beds, and metamorphic shales and sandstones, which crop out here and there all through the Tonis Cap range in south Gippsland. North or Upper Gippsland shows indications of great geological disturbance, even within comparatively recent periods. Though the general high level of this part of Gippsland seems to have permanently obtained, as shown by the absence of many of the intermediary strata, the granite substratum is broken by dikes of gneiss and porphyry (some of this porphyry is very beautiful); then immense beds of volcanic drifts, molten into solid masses as hard as even the porphyry, fill up great chasms adjacent. The unbroken portions of many of the high peaks are covered, in a north and south line for sixty or seventy miles, with a metamorphosed drift of almost pure silica, the pebbles in which are as round as marbles, with the heavy drift below, and the light above, as in ordinary stratified drifts, while the mass, to a casual observer, looks just like a solid body of quartz lying on the granite rock below. Now, all through this region, both north and south, I have heard those strange noises, but most frequently around Cobena Creek, in North Gippsland. My first experience of them, however, occurred on Stockyard Creek, in South Gippsland, where the miners were often startled by them. Two days in particular, in the early summer of 1879, will be always remembered by them. Almost precisely at noon on the first of those days, a deafening report was heard, which could be likened only to the explosion of a magazine; it brought every man below ground to the surface, as quickly as he could get, who was not already up for dinner. The explosion seemed to be in the direction of the Ophir mine, which lay about half a mile to the west of the main diggings, and as it was known that the "Kaffirs Company" had considerable dynamite stored in that vicinity for blasting purposes, a general rush took place to render assistance or view the supposed ruins; but the magazine and the Kaffirs and the Ophir men were all there and all right, so the crowd returned, but awestruck, excited, and wondering. The weather had been strangely oppressive for many days preceding this event, with a preternatural stillness in the air and a kind of haze over everything, the temperature varying but little night or day and ranging between 75° and 85°, which was not really unusually hot for the place and time of year; but its awful sameness was portentous, and old New Zealand diggers who were on Stockyard Creek at the time often remarked that it felt "earthquaky." This first explosion was variously attributed by the local contingent to the sudden escape of gases generated in the coal basin, the edge of which bordered the gold fields; to water pressure from the mountains above, and to the fall of an unseen thunderbolt. However this may have been, the second notable explosion, which occurred just two weeks after the first and also, by a singular coincidence, almost precisely at noon, left no room for argument, as it was evident from the severe shock of earthquake which accompanied and followed it that whatever caused the earthquake had also caused the explosion. The shock was extremely severe, the direction being from northeast to southwest, starting simultaneously with the report, with a quick horizontal movement which threw down nearly every dead tree on the flat. Many of them were 150 feet in height and 3 to 4 feet in diameter, and all fell in the same direction. Some of the green trees, too, which had not good, strong tap roots, were thrown down, and the whole forest swished and bent like willows, as though struck by a mighty wind. A large iron tank measuring 4 feet cube, and full of rain water, was moved bodily from the platform about one foot in height on which it stood, and deposited on the ground alongside. It was not overturned; the ground simply moved from under it and caught it as it fell. A very remarkable feature was that the trees were all thrown with their tops in the direction of the earthquake's path, while dead weights on or near the surface were, as it were, left behind by the moving earth and maintained their new position simply by friction. The trees, it would seem, while still supported by the earth around their roots, added the force of their own rebound to the return of the earth's vibration and so fell beyond their original position. A man standing on a stool whitewashing a veranda was left standing on the boards below, with his brush still elevated and wondering what had happened to him. Another party was dropped down a shallow shaft in which he had just been working, as he was leaving for dinner. He landed bolt upright and shaken considerably by the drop.

We did not lack for variety with our "barisal" gun experiences on Stockyard Creek for the next three or four months; though not in all cases accompanied by shocks of earthquake, we heard them at intervals during all that period, both at night and in the daytime, and it did not matter at what time of night a noise of that kind was heard, it brought every man on that diggings to his hut door to find out from his neighbors what was the matter, and nobody hurried to get to bed again. Subsequently I joined a party to prospect for tin on the Franklin River, some distance to the north of Stockyard Creek, all of whom heard there the same mysterious reports. The rock formation in that vicinity was almost wholly granite, and as there were no deposits of coal or lignite within many miles of us, we could not attribute them to explosive or escaping gases. They occurred at frequent but irregular intervals, and varied in tone, intensity, and volume from a boom like a heavy cannon, both close at hand and afar off, to the discharge of small arms, or a very peculiar, low, distinct, and extremely deceptive hiss, which often started some one of us in search of an invader of our solitude, to return as often disappointed. From the Franklin, we prospected into the wilder region of North Gippsland, but were not troubled much by any mysterious sounds until we reached Cobena Creek, where we made a camp and remained for about eight months. On a spur above one of the tributaries of this creek, which, by the way, is right in the heart of the volcanic region, with wildly picturesque scenery and steep acclivities, mountain tops strewn with huge, rugged granite masses and volcanic scoria everywhere, we found, in addition to some promising though not payable gold prospects, a very fairy land of "barisal" guns. The reports were very seldom much louder than the "ping" of a rifle, and never, at least during our stay in that region, followed by any symptoms of earthquake; but we heard them so often, sometimes twice or thrice in quick succession, and from such unlooked for places, that a superstitious man would certainly think them uncanny, and a timorous one, who knew the sound of a rifle, would as surely duck his head.

Photometry of Colored Lights.

An ingenious and simple method of comparing the luminosities of differently colored lights is described by Frank P. Whitman, in the Physical Review of recent issue. The principal on which Whitman's photometer is founded is due to Professor Rood. Rood prepared about fifty gray disks differing successively in depth of tint from black to white. If a dark shade was combined with a light shade in the usual way and rotated rather slowly, the familiar unpleasant sensation known as a "flicker" was produced; but if successive pairs, more and more nearly alike, were chosen, the flicker became less, until it almost, or quite, disappeared. Nearly the same effect was produced if, instead of a gray, some other color was substituted on one of the disks. It was always possible to combine with it a gray disk of such a shade that the flicker nearly ceased, showing that this sensation is apparently independent of the wave lengths of the lights compared and dependant only on the relative luminosities. In Whitman's instrument a colored card and a white card are alternately exhibited to the eye of the observer. These cards are illuminated by lights of different intensities placed at opposite ends of a graduated photometer bar. By moving the support on which the cards are fixed along the photometer bar, a point is reached at which the "flicker" ceases. At this point the illumination of the white disk or card is taken to be equal to that of the colored card, and the relative intensity of the sources of light can be calculated. Of course, instead of a colored card a colored light may be subjected to measurement. This instrument is said to give results quite as good as are obtained when two lights of the same color are compared by the ordinary photometer.

LI HUNG CHANG submitted to a Roentgen ray examination at the Charlottenburg Polytechnic, at Berlin, on June 27. It showed the track of the bullet fired by the would-be assassin of the Chinese statesman at Shimonoseki, when the treaty between China and Japan was being arranged. The bullet entered the left cheek and buried itself in the tissues slightly below, where the bullet is now encysted.

PROF. J. H. MIDDLETON, director of the South Kensington Art Museum, an archæologist of highest rank in England, died suddenly recently, and an inquest showed that he had taken an overdose of morphine, having been a victim of the morphine habit for years. He wrote an important book on "Ancient Rome," and had been Slade professor of fine art and director of the Fitzwilliam Museum at Cambridge University before receiving his last appointment. He was also one of the most important contributors to the Encyclopedia Britannica.

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RECENTLY PATENTED INVENTIONS.

Engineering.

SIGNALING SAFETY VALVE.—John J. Roy, Lawrence, Mass. This is an inexpensive boiler attachment, so arranged that the escaping steam sounds an alarm without creating an undesirable back pressure. From one side of the safety valve extends an outlet pipe, from which projects a horn or whistle, and at the point of its projection drops a loop or U-shaped pipe adapted to contain either water of condensation from the steam or water filled directly into the loop. The water creates sufficient back pressure to sound the alarm, but this need not be more than about a pound, and there is no back pressure until the valve is opened.

QUICK ACTION TRIPLE VALVE.—William Hirst, Trenton, N. J. This improvement relates to a formerly patented invention of the same inventor, the improvement providing for automatically moving the triple valve into a released position for recharging the auxiliary reservoir without releasing the brakes, and always maintaining the pressure in the brake cylinder. The invention is especially applicable to the brakes of the ordinary Westinghouse system, and consists of a retaining valve of especial construction, comprising a casing into which opens the exhaust port of the triple valve, a cap on the casing communicating with the main slide valve chamber, while a spring-pressed piston valve has seat faces, one of which is seated on the cap, to close the connection between the triple valve exhaust port and the main slide valve chamber.

FLUID PRESSURE BRAKE.—John M. Hurst, Salt Lake City, Utah. This invention is designed to give the engineer full control of the pressure in the brake cylinders, to increase or decrease the pressure at will and recharge the train while the brakes are set, utilizing also the air which, according to the present practice, is allowed to escape to the atmosphere from the preliminary exhaust port of the engineer's brake valve. The invention comprises a retaining valve and a retaining reservoir connected to the preliminary exhaust port, with connections from the brake cylinders to the retaining valve, the valve and reservoir being usually located on the engine.

Railway Appliances.

WRECKING FROG.—Charles K. Marshall, Tacoma, Washington. For placing derailed cars back on the track, this inventor has devised a simple and inexpensive device. It consists of an inclined support, having its sides similarly constructed to adapt it to fit upon either rail and to extend in either direction, a reversible switch rail having a removable and adjustable connection with the support. With this device the car can be readily pulled upon the frog and incline, and its wheels guided upon the rails of the track, permitting cars on either side of the track to be readily replaced on the rails.

SWITCH.—John M. Perkins, Brooklyn, N. Y. This is an improvement more especially adapted for adoption by street railways, the construction being simple and the invention providing for the shifting of the switch while the car is in motion by a projection operated from the front platform of the car. Centrally of the road bed, opposite the switch rails and a switch point, is embedded a face plate, on which are pivoted two shifting arms, each pivotally connected with a shifting bar having pivotal connection with the switch point, and between these arms is a wedge-shaped guide block, to guide the switching device pendant from the car, and move one of the switching arms.

MAIL BAG CATCHER.—William T. Stuart, Cheyenne, Wyoming. This device is designed to project outwardly on the car and to move into engagement with the bag, so as to direct the latter bodily into the car, the bag not being bent or crushed and being handled with less liability to injure its contents than is possible with other devices. The catcher may be adjusted to operate at either side of the car, and when the car is going in either direction.

Electrical.

PERFORATING MACHINES.—Joseph J. Reifgraber, St. Louis, Mo. This is a machine by means of which a strip of paper or other nonconducting material is perforated to represent printing characters to be electrically transmitted to one or more distant stations by a special transmitter, and then received by a special receiving mechanism in type-written Roman characters or figures. The characters received may be impressed in a strip of fiber or other suitable material from which stereotypes may be cast to be printed like other matter, or to be received on one strip in type-written print and on another strip in perforations. The machine is also designed to compose and perforate into a transmitting strip "solid" or "display" matter having the same appearance as hand work in typesetting, making long or short lines and justifying and correcting every line before it is perforated into the transmitting strip.

PRINTING TELEGRAPHY. — A further invention of the same inventor provides a transmitter for sending the impulses required for sending the message, a synchronizer and distributor for receiving the impulses over a single wire and sending them to the different magnets in the printing and reproducing mechanism, together with such a mechanism for printing on paper, impressing a strip of fiber or other material for a matrix, or perforating a strip of paper or other non-conducting material, which may then be used to operate a type-composing or type-bar producing machine. The invention provides a machanism to operate a type-composing or type-bar producing machine in connection with the perforated copy, and the electric circuits and devices for controlling the same.

ELECTRIC RAILWAY SYSTEM.—David M. De Witt, Morrillton, and William K. Elliott, Little Rock, Ark. According to this improvement the line conductors are carried in a conduit or insulated track box midway between the rails, and contact devices are located at intervals along the line to be actuated by the moving cars, whereby the energy for operating the motor of the car is transmitted. On the inner side of each rail is a pivoted spring-pressed contact rail, to be engaged by the flange of the wheel of a passing car, and the contact rail is pivoted to an inwardly extending link adapted to make contact with contact blocks electrically connected with the line conductors, or lead and return wires.

Mining.

CONCENTRATOR. — William H. Rockfellow, Baker City, Oregon. This invention relates to placer and quartz mining, providing a simple and inexpensive construction designed to save the fine gold in the sand and pulverize quartz. It comprises a table mounted to rock sidewise about a longitudinal subjacent axis, the table having an end discharge and screening and amalgamating devices, whereby the sand and water in passing through the machine will be constantly agitated and a thorough mixing of the sand with the mercury will be effected. At the discharge end of the machine is a water wheel actuated by the discharged material, and thus affords power, by a crank and lever connection, to give to the table its rocking movement.

Mechanical.

PUMP.—William P. Keeler, Spokane, Washington. This is an improvement in pumps which have eccentrically mounted and rotating pistons, the invention providing an effective pump of simple and inexpensive construction. Fitted in the casing is a solid revoluble cylinder provided with grooves forming two oppositely arranged eccentric pistons, the cylinder dividing the casing into two compartments, and hinged valves resting upon the pistons. A chest above the casing is provided with two compartments communicating with the casing, a valved discharge being connected with each compartment of the chest.

WINDMILL ATTACHMENT.—Morrison M. Kingman, Chelan, Washington. For varying the stroke of the pump rod of windmills, so that the pump will be operated uniformly, notwithstanding the variations in the operations of the windmill pitman, this inventor employs two levers to form guideways, fulcrumed one at each side of the windmill frame and respectively connected to the pump rod and to the pitman, there being between them a slidable bracket capable of movement to and beyond each side of the pitman and pump rod. By this movement of the bracket the motion transmitted between the two parts may be increased or diminished.

Agricultural.

HARROW.—John McCormick, Brooklyn, N. Y. In this harrow the teeth have a circular movement, the frame of the harrow carrying a disk to which are fixed rings concentric with each other, there being between the fixed rings a movable ring carrying teeth, and the ring being driven by gearing and clutch members on the axle engaging the wheels. As the machine moves forwardly the rings travel in circular paths and cause the teeth to effectively cultivate the ground, but either or both sides of the disk may be raised by a lever to avoid obstructions or throw the machine out of operative adjustment.

HANDLED CLAMP FOR HOLDING PLOWSHARES.—Charles Nerud, Elroy, Wis. This invention provides a tool designed to be more efficient and durable than the tongs generally employed in handling and repairing short landside plows, more firmly clamping the share and landside, and more readily adjusted to and removable from the plow. It comprises a handle having a transverse opening and a transverse head projecting from one end, there being share-securing devices at each end of the head, while a brace, extended transversely through the opening in the handle, has at its outer end means for securing the share and for adjustably securing the brace. The tool is strong enough to resist bending when heated, enabling the share to be rigidly held when being sharpened or welded, affords a ready and wide range of adjustment, and prevents all springing of the plow while sharpening or pointing.

PRESERVING MILK AND CREAM.—Edward P. Hals, New York City. This inventor has devised a method of preserving milk and cream and similar liquids in such manner as to destroy all germs and other injurious matter, and at the same time facilitate transportation to market. The milk or cream is first sterilized in bulk at about 167° F. and then immediately and quickly cooled to about 50° F., when it is placed in metal boxes or barrels of desired size and shape and frozen solid, being afterward removed and sent in sealed packages in refrigerators to market.

GATE.—William Heaton, Allerton, Ill. This is a simple and inexpensive gate which any farmer may make for himself, and which may be so hinged as to be opened or swung from either end, or may be entirely lifted off and set to one side when necessary. It has two vertical parallel bars at each end, and the upper horizontal bars are doubled at the top to form hinging supports. There are two posts at each end, a shorter one being connected to a longer one by a crossbar and having its end extending into the space between the top bars of the gate and forming a pintle. By means of a removable section, the gate may be hung so as to swing above snow.

GATE.—James Simpson, Veedersburg, Ind. This patent is for an improvement on a formerly patented invention of the same inventor, simplifying the operating mechanism and affording complete control of the gate from either side, allowing one to stop the gate at any point after starting to open or close it, and also allowing it to be readily opened or closed from any point where it may be at rest. The gate controlling mechanism preferably consists of controlling and operating levers and their connections, without employing cables or their equivalents, or pulleys and similar guides.

SCRAPER AND LEVELER.—Gilman N. Folsom, Hobart, Nevada. This is a combination machine adapted to scrape and level roads, or to pulverize and level ground and save the work of a harrow, and which may also be advantageously employed in building new roads. It consists of a frame having a forward and a rear transverse runner, with inclined under surfaces, with a scraper blade adjustably mounted on the forward runner and means for rocking it. The earth may be scraped and carried in advance of the machine to any desired point, and then gradually or instantly released for filling purposes, and made level by the leveling attachments. The latter are so constructed as to ride up a mound of loose earth while leveling it, causing the team the least possible exertion.

Miscellaneous.

TIME INDICATOR AND REGISTER.—James M. Helfenstein, New York City, and William K. Holmes, Brooklyn, N. Y. This improvement embraces a working mechanism which is preferably arranged in connection with the gearing of an ordinary clock, in a clock casing of ordinary size, and is adapted to indicate the expiration of fractions of an hour or longer time, as may be especially desired in teaching or practicing music lessons, etc., where limited periods are given to certain exercises. It also has a suitable registering device which automatically registers the aggregate periods of time devoted to exercises or other work.

STEAM BAKE OVEN.—Adam Spangler, Silverton, Oregon. A boiler forms the top of the combustion chamber of this oven, and above the boiler is located an oven supported by brackets, the oven being completely surrounded by steam spaces except at the front, thus producing a uniform heat, and the arrangement being such as to obtain the greatest efficiency from the fuel. By means of steam supply pipes any desired amount of steam may be injected into the ovens, giving a moist heat, insuring a perfect baking of bread or other material and giving a fine luster, without danger of burning.

TANNING PROCESS.—John C. Rogers, Cuero, Texas. According to this process the hides may be limed and unhaired in the usual way, after which they are subjected to a threefold bating process. The first bate consists of a weak solution of sulphuric acid, to soften and plump the flesh, and thus facilitate its removal; the second bate is of soapsuds, followed by soaking in cold water and slicking, and the third bate is a solution of salt, for a few minutes, to toughen the hides. The hides are afterward placed in tan vats with bark, and covered with a solution of alum and water, where it is designed they shall be thoroughly tanned without any changing of barks or raising the hides.

BAG HOLDER. — William H. Boyd, Gainesville, Fla. This is a device which may be used to advantage in connection with platform scales, holding the bag suspended and with its mouth fully opened for the introduction of material, while allowing the filled bag to be quickly released when desired. It comprises an adjustable base with bracket stand, a forked arm on which is hung a rectangular frame, and hooks pivoted to rock on opposite sides of the frame, with other novel features, designed to facilitate the filling of a certain weight of material in sacks or bags, and thus quickly making a large quantity of merchantable packages.

HORSE COLLAR.—Richey G. Lehman, San Diego, Cal. This improvement relates especially to breast straps or breast collars, providing a simple and improved form adapted for heavy as well as light work, and which shall be light and ornamental and easy upon the breast and shoulders of the horse. Two nearly triangular padded or stuffed side portions are connected together across the breast by a flexible connection, their rear opposite sides having means for attachment to the traces, and the upwardly extending portions being connected together across the neck, such portions being formed in two separated plies constituting loops for the passage of the reins, and thus dispensing with the employment of rings.

MEASURING MACHINE. — Hermann P. Wolf, Burlington, Iowa. According to this invention a stationary or revolving cabinet, provided with one or a number of compartments, in which may be kept spices, powder, seeds, etc., is provided with means for measuring out or dispensing such amounts of material as desired. In each compartment are upper and lower divisions and a pivoted trough of definite area, designed to hold a specific quantity of the material to be measured, and by turning a handle such quantity of material is released and discharged into a scoop placed to receive it. The device is very simple and inexpensive, and is designed to prove a great convenience to storekeepers and others.

MILK RECEIVER.—Charles M. Wilkins, Wilmington, Del. This invention is for a receptacle to be placed within the house to receive milk poured through a funnel from the outside, so that it cannot be tampered with by outsiders, and the contents will be wholly protected from dirt or dust. The receptacle is adapted to be secured to the inside of a door, and has a removable top with a vertical open portion covered by a swinging door, a curved milk tube being adapted to be inserted through an opening in the door to engage with and open the door, and afford means for pouring milk from the outside into the receiver.

CURTAIN HOLDER.—Charles J. Swanstrom, Deadwood, South Dakota. This is an improvement in open hook window curtain holders adapted to be secured to the window frame or casing, the novelty of the device consisting in a stop provided for the pivoted rotatable curtain hook proper, holding it horizontal in its normal position of use. The hook may be swung around from such position to hang downward at the side of the window, its position when not in use. The device is very simple, and easily secured to or removed from the window frame.

SHADE ROLLER TIP. — William B. Shaw, Brooklyn, N. Y. This inventor provides an extensible tip for spring shade rollers, enabling the ends of the roller to be adjusted horizontally. The shade attached to a roller with this improvement may be centered, and the same roller may be used on a wider window, the adjustment being effected without interfering with the spring in the roller. The shade roller has in one end a bore, and fitted to slide on the bored end is a tip having a longitudinal slot for permitting the shade to be secured to the end of the roller, there being a spring mechanism carried by and movable with the tip.

INFORMATION CARD.—Henry P. Stamford, Grand View on Hudson, N. Y. For cards bearing classified information so as to be easily accessible, this inventor has devised a system by which the cards are so constructed that any given series numerically, alphabetically or otherwise designated may be simultaneously and quickly gathered and drawn from an apparently miscellaneous pack of cards. The cards have openings in a certain order, those designed for recording the same kind of information having similar openings, whereby these openings will be in alignment when the cards are placed in a pack. The cards are used in connection with a box or drawer having corresponding registering openings, a lifting pin being adapted to pass through the box openings and into sundry of the openings in the cards, the cards of a certain series being entered by a pin and elevated without disturbing the other cards.

PAPER DOLL AND DRESS FOR IT.—Mariana T. Jones, Boston, Mass. According to this invention the body and dresses of a paper doll are so made that the dresses will be held firmly to the body, and the doll when dressed may be freely handled without fear of the costume dropping from its body. The invention also provides fastening devices for attaching the costume to the body of the doll, such fastening devices being made in a very simple, durable and inexpensive manner, and readily and conveniently applied to the body of the doll.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

BIBLIOTHEQUE DE PHOTO GAZETTE-LES PETITS PROBLEMS DU PHOTOGRAPHE. Par E. Wallon. Paris: Georges Carre, editeur. 1896. Pp. 72. Price 50 cents.

The little hitches in photography that always trouble the amateur, such as the depth of focus, hyperfocal distance, and similar points, are here given in clear summary, so that the book, for those photographers who read French, must be warmly recommended as useful.

CUSHING BOILED DOWN. An A B C guide to Parliamentary law based on the highest authorities and adapted to general use. By F. M. Payne. New York: Excelsior Publishing House. T. J. Carey & Company. 1896. Pp. 127. Price 50 cents.

It is said that there is wisdom in a multitude of counselors, and the experience of mankind has shown that strict rules of order are essential when such a multitude are assembled. Cushing's manual has met with wide acceptation, and the following little work, an abstract thereof, deserves commendation for its neatness and convenience. As a sample of its treatment of a subject we commend the paragraph on "previous question," which is at once historical and technical.

MECHANICAL-ELECTRICAL POCKET DICTIONARY, WITH MECHANICS' TABLES, GEAR PRACTICE, ETC. Edited by F. D. Leslie, assisted by Arthur R. Curtis and others. The chapter on gears being by George B. Grant. Cleveland, O.: The Mechanics Publishing Company. Pp. 348. Price $1.50.

This excellent little book will be found useful for mechanics and electrical engineers. It contains numerous tables, in the main very well selected, and various information relating to engineering in general which cannot fail to be acceptable. Its size makes it a veritable pocket manual.

MATRICULATION DIRECTORY, No. XX, JUNE, 1896. With articles on the special subjects for January and June, 1897. Price 50 cents.

This book, although arranged exclusively for the London or English horizon, will be found to be very useful by educators of other countries, in showing the drift of thought and of practice in England, and the scope of examination required under the London University system, and should with these advantages meet very considerable circulation in America among those in charge of its educational field.

MONEY, SILVER AND FINANCE. By J. Howard Cowperthwait. Third Edition. New York: The American News Company. 1896. Pp. 242. Price 25 cents.

The so-called dreary science of political economy, if it be made to include finance, bids fair to become a very interesting subject, at least one affecting very vital interests, within the next few months. The present little essay is from the standpoint of a believer in gold and seems to be very interestingly and well written, and will, we are convinced, meet with warm appreciation from its readers.

SOMETHING ABOUT X RAYS FOR EVERYBODY. By Eward Trevert. Illustrated. Lynn, Mass.: Bubier Publishing Company. 1896. Pp. 78. Price 25 cents.

DIE GRUNDLEHREN DER ELEKTRICITAT. Mit bersonderer Rücksicht auf ihre Anwendungen in der Praxis. Von W. Ph. Hauck. Mit 82 Abbildungen, Dritte Auflage. Wein, Pest, Leipzig. A. Hartleben's, Verlag. 1896. Pp. 295. Price $1.

Prof. Eder's "Jahrbuch" für Photographie und Reproductions technik für das Jahr 1896 has just been published and it brings on 645 pages a large number of original articles, by well-known writers, on the present state of the photographic art, and a review with text illustrations of the progress made in this art during the years 1894 and 1895. Considerable space is given to interesting articles on color photography and color photographic printing, and special attention is called to an article on this subject by Dr. O. Wiener, pages 55, 187. A large number of beautifully executed plates showing the present state of the art accompany the volume. The publisher is Wilhelm Knapp, Halle a. S., Germany.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(6920) S. J. says: Can you give me a remedy for perspiration of the feet? A. A German pharmaceutical journal recommends the following:

Carbolic acid	1 part.
Burnt alum	4 "
Starch	200 "
French chalk	50 "
Oil of lemon	2 "

Make a fine powder, to be applied to the hands and feet, or to be sprinkled inside the gloves or stockings.

(6921) P. B. V. says: Please give me, through your Notes and Queries column, a method for removing wrinkles in imitation parchment. A. To smooth parchment which has become wrinkled, place the parchment face down upon clean blotting paper. Beat up to a clear froth, with a few drops of clove oil, the whites of several fresh eggs, and with the fingers spread this over the back of the sheet and rub it in until the parchment becomes smooth and yielding. Then spread it out as smooth as possible, cover with oil silk and press for a day. Then remove the silk and cover with a linen cloth and press with a warm iron.

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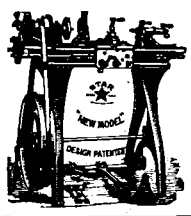

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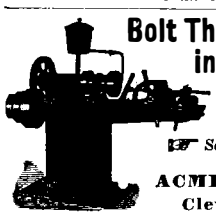

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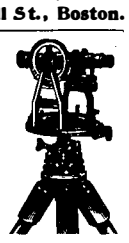

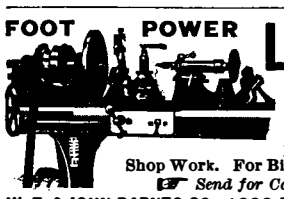

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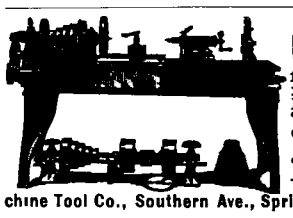

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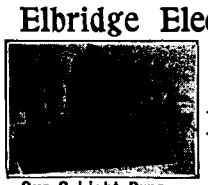

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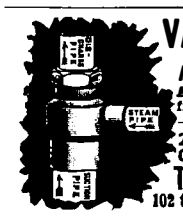

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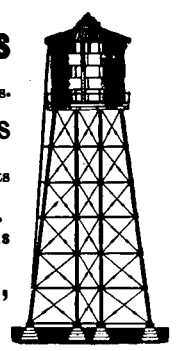

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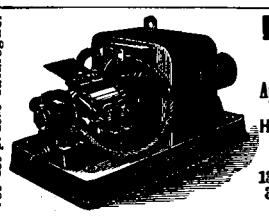

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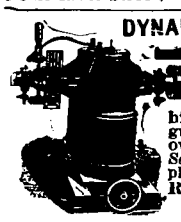

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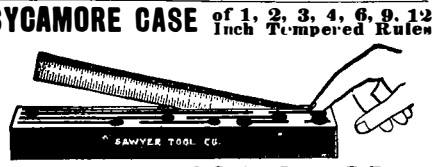

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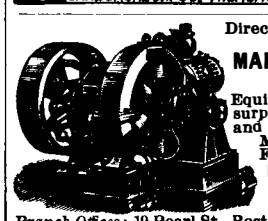

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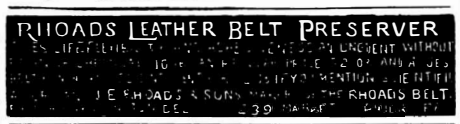

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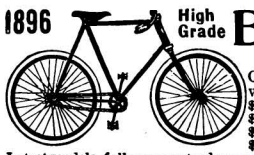
1896  **High Grade Bicycles**

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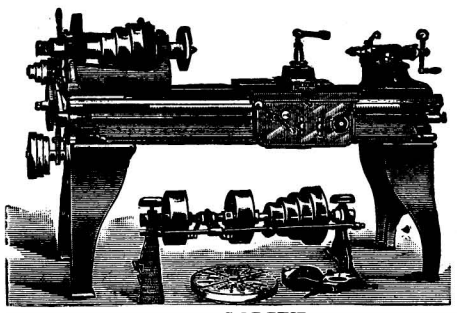

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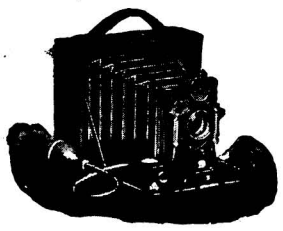

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